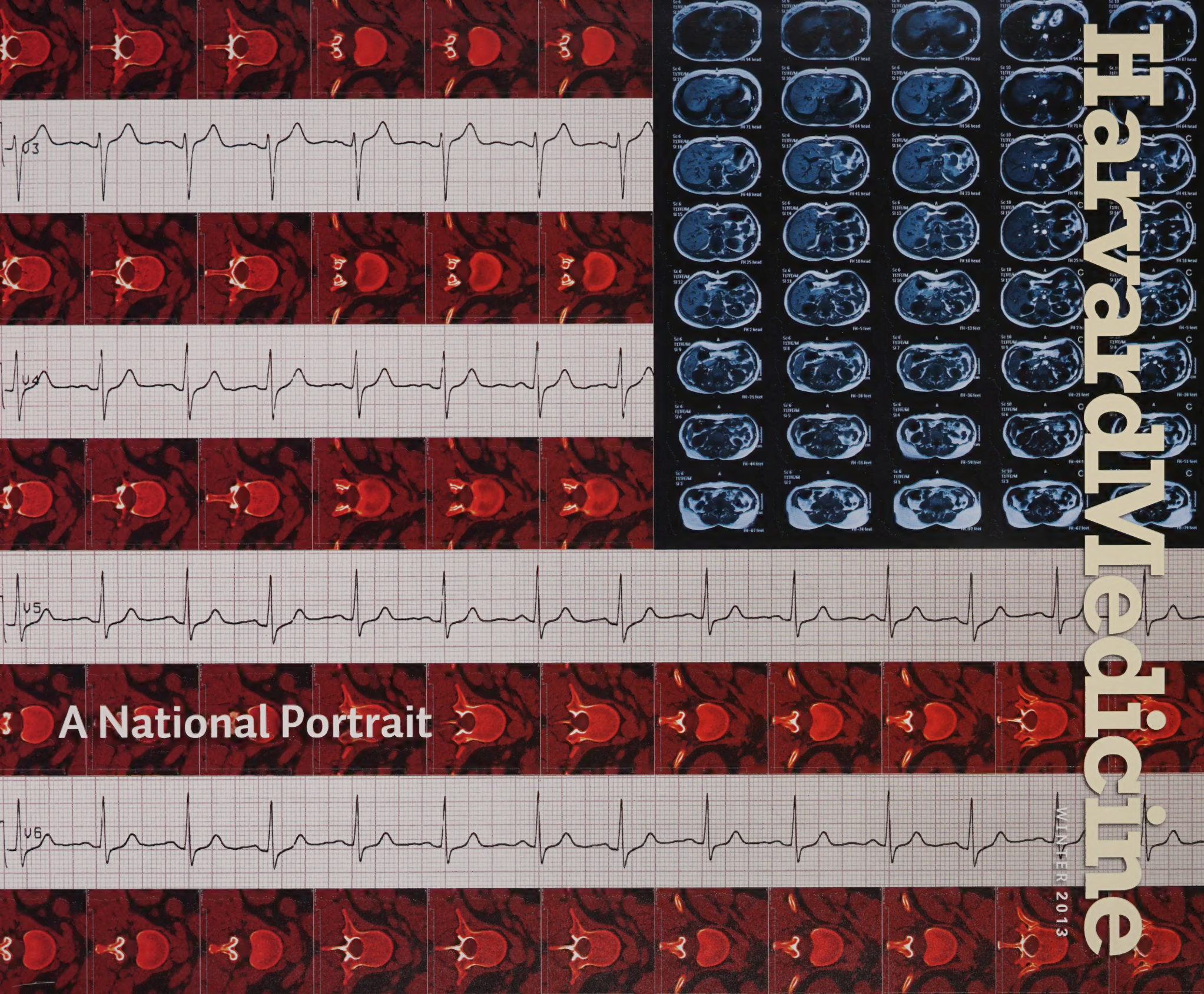

Harvard Medicine

WINTER 2013

A National Portrait

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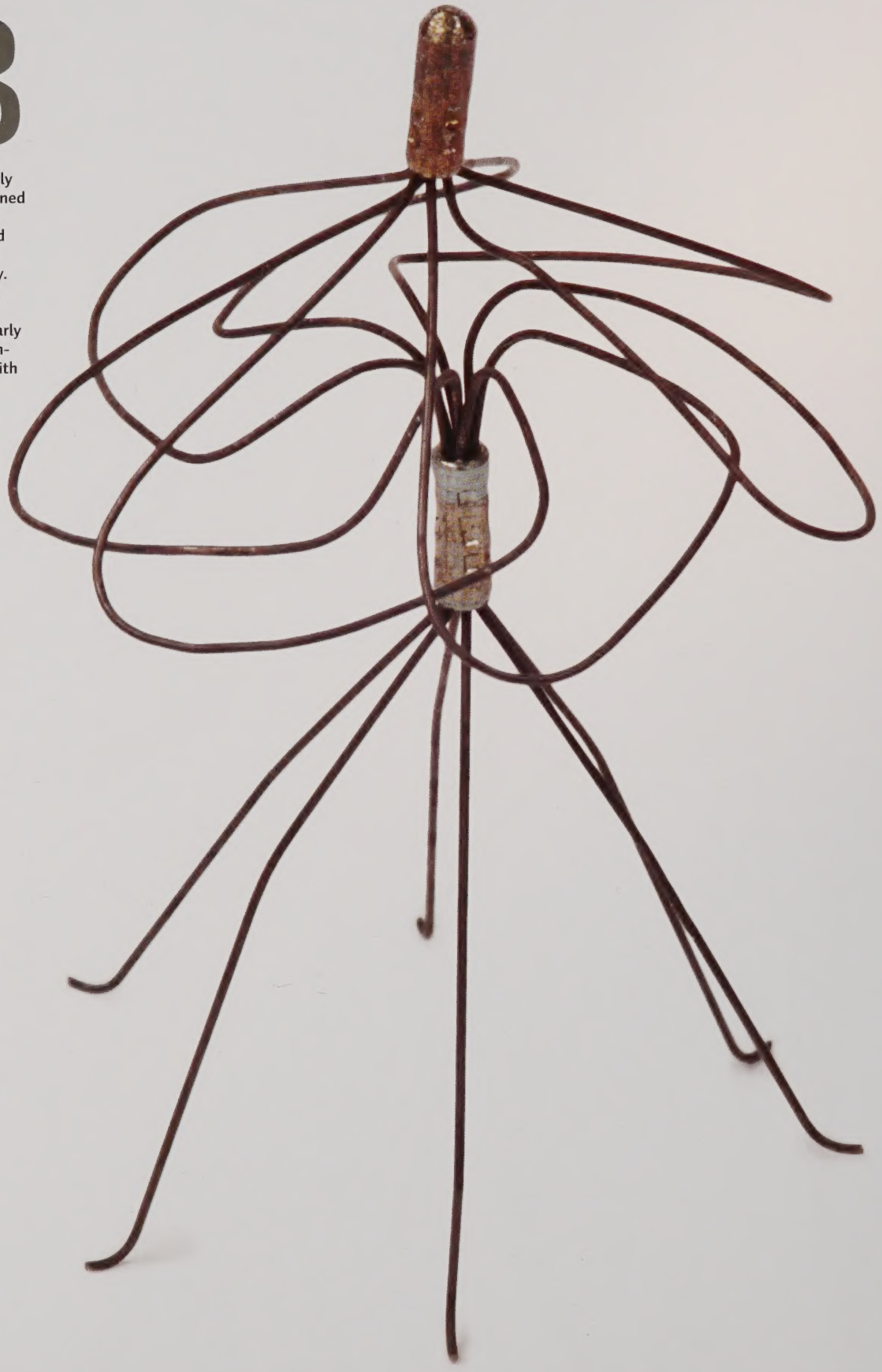
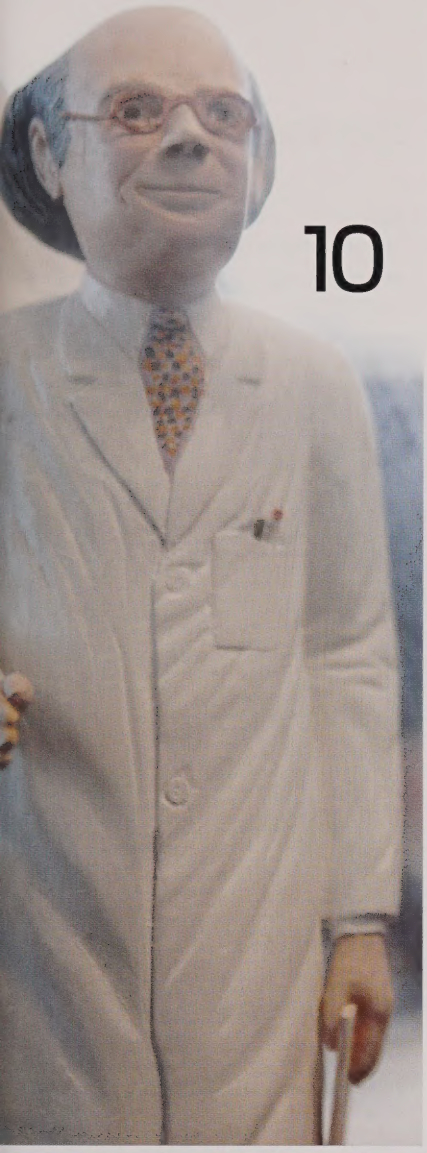
WINTER 2013 | VOLUME 86 | NUMBER 1

OPEN SOURCE: In the early 1970s, Morris Simon designed this and other stents from nitinol, a NASA-developed nickel-titanium alloy that exhibited thermal memory. The stents, now housed in the Francis A. Countway Library of Medicine, are early examples of therapeutic interventions for patients with cardiovascular disease.



COVER: MATTIAS PALUDI



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From the Dean

THOUGHTS ON INNOVATION

WE ALL WORRY ABOUT OUR HEALTH. And increasingly we worry about the health of our nation. This issue's cover reinforces that national perspective and serves to remind us that we have access to a wealth of medical information that can be plumbed, decoded, and applied to those national concerns.

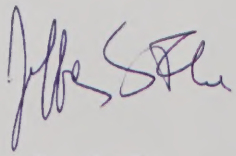
To give a perspective on where progress is being made—and what work remains to be done—we turn our focus to two conditions, pregnancy and cardiovascular disease, both very much a part of our nation's fabric. We also look at the practitioners who are most likely to deliver first-line care.

Every day we are reminded how commonplace pregnancy is, as we work or walk beside women who are expecting, or, as physicians, stand at their side as they give birth. Here at HMS, the latter keeps many of us busy: approximately 21,000 babies are born at our Harvard-affiliated teaching hospitals each year. And while our article on obstetrics shows that it remains a profession filled with joy, it is also a specialty with its share of challenges as technology and social changes push the boundaries of who can become pregnant and when.

Cardiovascular disease may not be visible, but it, too, is prevalent. Our ability to recognize and treat some of its leading risk factors has meant improvements in mortality rates and in disease prevalence. As you will read, however, the challenges now faced by physician researchers include understanding the effects that biology and social constructs bring to the exam table.

Any discussion of the health of our country's diverse populations should also touch upon the role of those who deliver their care. And in this issue, we do just that: We highlight the dynamic work of our new HMS Center for Primary Care; peer into one alumnus's efforts to transform his primary care practice; and present portraits of family medicine practitioners. Each account reminds us that the depth and intensity of the doctor–patient relationship continues to be a powerful factor in the practice, and evolution, of medicine.

As you read the stories of work by colleagues near and far, I hope you will join me in celebrating their successes in bringing about change. HMS continues to be an innovation leader, and its physicians and researchers continually find solutions to seemingly intractable problems. And that's a good thing, because addressing the issues that face our nation's health will require the efforts of all of us, working together.



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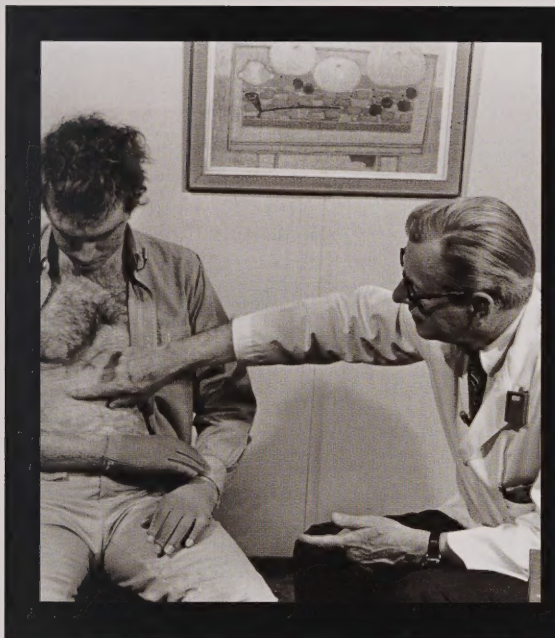
JOHN SOARES

Letters to the Editor

CHART NOTES FROM OUR READERS



A Kind Touch

Burke was a fine human being, and I was only one of many whose lives or careers were enriched by his concern for others.

ANTHONY PATTON '58
DANVERS, MASSACHUSETTS

A Final Word

I was amazed, and humbled, to be profiled in the Spring 2012 issue of *Harvard Medicine* as a result of my work in aerospace medicine. I initially was pleased to be on the last page of the issue; I had the grandiose thought that the editor had saved the best for last. Then I realized my write-up immediately followed the obituaries! I promptly contacted the editor to ask if she knew something that I didn't. Upon being reassured such was not the case, I was able to enjoy the rest of the great issue discussing the multiple medical benefits resulting from space and atmospheric flight.

ROYCE MOSER '61
SALT LAKE CITY, UTAH

Burke's Law

The Autumn 2012 issue of *Harvard Medicine* was a fine tribute to those who deal with the difficult problems related to trauma and stress. The article "Surface Tension" by Elizabeth Dougherty was particularly meaningful. Charli Kerns's description of how John Burke '51 discovered a method to enhance new skin growth in burn patients by use of a protective cover and scaffolding was also highly informative.

Many believe John (Jack) Burke should have won the Nobel Prize for his work on so-called artificial skin. His organization of the Shriners Burns Institute at Massachusetts General Hospital created a center for the treatment of burn patients as well as a rational referral method from what had been a patchwork of individual efforts with poor results. As a result of this work, hundreds of lives were saved.

Burke was a superb technical surgeon, one of a series of brilliant residents in surgery at Mass General during the fifties and sixties. In addition to being a master clinician, he was an exemplary leader. In 1957, I was a fourth-year HMS student serving on the West Service at Mass General. Burke was chief resident. He ran a tight ship, but was always fair. When one of the Mass General interns on the service became terribly ill, I was enlisted to become a "striker," or temporary doctor, on the ward and given all the responsibilities and privileges that went with the job, including a marvelous white suit. Instantly, I was writing orders and prescriptions, was first assistant at major operations, and was in charge of the sick patients on White 6. Honored but anxious, I literally was afraid to leave my duties.

On a Saturday morning, after I had spent four days in the hospital, Burke grabbed me by my special white jacket and told me to go home and not come back until Monday morning. But who was to cover, I protested. "Don't worry," Burke replied. When I returned Monday for 6 a.m. rounds, I found that Burke himself had answered call for me, an extraordinary act of kindness that I have never forgotten. Burke was a fine human being, and I was only one of many whose lives or careers were enriched by his concern for others.

ANTHONY PATTON '58
DANVERS, MASSACHUSETTS

Harvard Medicine *welcomes letters to the editor. Please send letters by mail (*Harvard Medicine, *107 Avenue Louis Pasteur, Suite 111, Boston, MA 02115); fax (617-432-0446); or email (harvardmedicine@hms.harvard.edu). Letters may be edited for length or clarity.*

Dear Alumni, Thank You

The "Letters to the Editor" in the Autumn 2012 issue of *Harvard Medicine* included a request from Jules Dienstag, HMS dean for medical education, for alumni recollections of two former faculty members of the School: Judah Folkman '57 and Daniel Funkenstein. Your response to his missive was tremendous, a testament to your generous and loyal spirit. Our thanks to all who wrote. Your accounts will no doubt be quite helpful to Dr. Dienstag's research effort.

—*The editors of* Harvard Medicine

MATTIAS PALUDI

PLAYING IT SAFER

Ten-year initiative aims to improve the health and well-being of active and retired football players

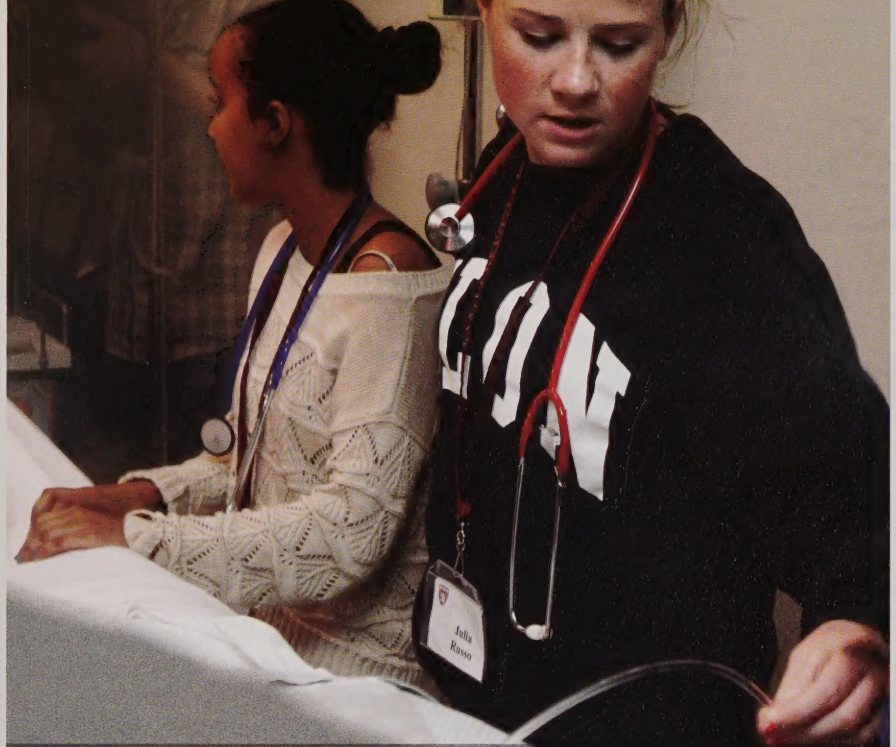
THE NATIONAL FOOTBALL League Players Association (NFLPA) has awarded Harvard Medical School a $100 million grant to undertake a 10-year initiative to discover new approaches to diagnosing, treating, and preventing injuries and illnesses in both active and retired players. The Harvard Integrated Program to Protect and Improve the Health of NFLPA Members will marshal the intellectual, scientific, and medical expertise resident throughout Harvard University.

"Our goal is to transform the health of these athletes," says Lee Nadler '73, HMS dean for clinical and translational research, Virginia and D.K. Ludwig Professor of Medicine at Dana-Farber Cancer Institute, and director of Harvard Catalyst, who will direct the program. "In order to extend the life expectancy and quality of life of NFLPA members, we must understand the entire athlete, all the associated health risks, and all of their interactions."

Professional football players often develop severe disability related to a number of health problems, including consequences of head trauma, heart problems, diabetes, joint and other skeletal injuries, and psychological stress. Americans have become increasingly concerned about the risks posed by participation in contact sports. The program's goal is to improve the health and well-being of NFL players, while further elucidating the risks of participation in American football.

Joining Nadler as co-director is Ross Zafonte, Earl P. and Ida S. Charlton Professor of Physical Medicine and Rehabilitation and chair of physical medicine and rehabilitation at Spaulding Rehabilitation Hospital and Massachusetts General Hospital, and chief of physical medicine and rehabilitation at Brigham and Women's Hospital. Associate directors are William Meehan'02, director of the Micheli Center for Sports Injury Prevention, an HMS assistant professor of sports and emergency medicine, and director of the Sports Concussion Clinic at Boston Children's Hospital, and Alvaro Pascual-Leone, HMS associate dean for clinical and translational research, professor of neurology and director of the Berenson-Allen Center for Noninvasive Brain Stimulation at Beth Israel Deaconess Medical Center. Herman Taylor '80, professor of medicine and Shirley Professor for the Study of Health Disparities at the University of Mississippi Medical Center, and director of the Jackson Heart Study, is a co-investigator. Members of the Petrie-Flom Center at Harvard Law School will help address ethical, legal, and policy issues relevant to the health of current, future, and retired players.

—David Cameron



FLOWER AND STEM

High-school students try their hand at medicine

JENNY SAID SHE WAS NAUSEATED AND WEAK. The 16-year-old also complained of hunger, yet said she was eating nonstop. The symptoms puzzled those reviewing them, so, determined to diagnose Jenny's malady, team members did a review of systems and recorded the adolescent's blood pressure, heart rate, known allergies, family health history, even Jenny's report on whether she was sexually active.

Thorough though they were, those reviewing Jenny's case were not doctors. And Jenny was not a patient in an emergency department. Instead, the "doctors" were high-school students, Jenny was a medical simulation mannequin at HMS, and the emergency department was a classroom. This was all part of MEDscience, a high-school science curriculum designed to increase students' interest and engagement in science, technology, engineering, and math (STEM) and the careers those sciences offer.

Cofounded by Nancy Oriol '79, HMS dean for students; James Gordon, an HMS associate professor of medicine; and Julie Joyal, program director, MEDscience integrates classroom learning with hands-on applications in the simulation centers and in one of the five HMS-affiliated teaching hospitals that the students regularly visit: Beth Israel Deaconess Medical Center, Brigham and Women's Hospital, Boston Children's Hospital, Massachusetts General Hospital, and Mount Auburn Hospital. The semester ends with the students writing essays reflecting on their experiences in the program.

"This is the only program we know of like this," says Joyal, who worked as a nurse for 25 years before joining the program. "The students learn core biology and health literacy, develop critical thinking and problem-solving skills and learn to work as a team."

Joyal says staff is undertaking a formal evaluation of the program, but that anecdotally, they know that some graduates have become emergency medical technicians, at least three have become nurses, and two have become medical students.

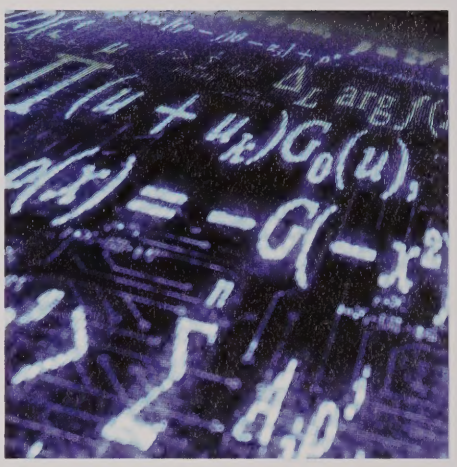
MEDscience began in 2005 as a one-week summer intensive course and grew into a semester-long class. Currently, students from Boston, Brookline, and Watertown public schools are enrolled. Every year there is a wait list and, at present, 200 students at Brookline High School alone are hoping for a berth next year.

"It's awesome watching them think through science," says Oriol. "They follow the same steps as medical students, pulling on what they've learned and testing hypotheses."

Back in the "clinic," the students overseeing Jenny's care used their newly gained knowledge of the endocrine system to diagnose their patient. Their diagnosis was correct: diabetes.

—Katie DuBoff

JAKE MILLER; ISTOCKPHOTO.COM (FAR RIGHT)

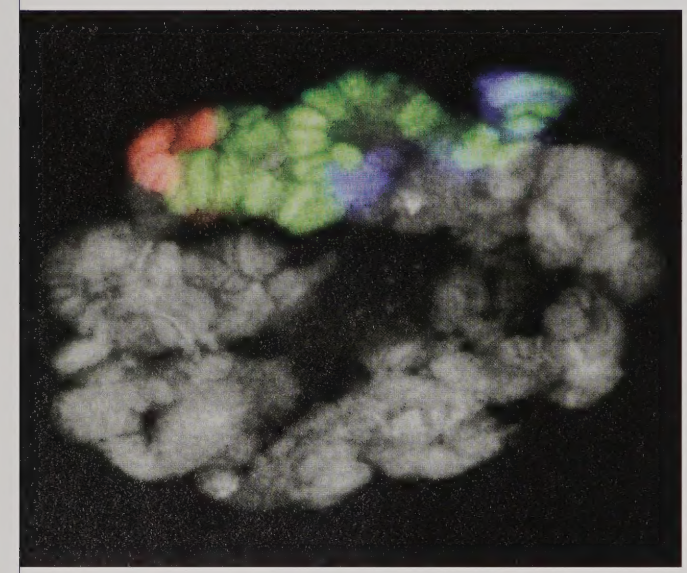


Sound Research

RESEARCHERS FROM HARVARD MEDICAL SCHOOL, Harvard Business School, and the London Business School have demonstrated that a crowdsourcing platform pioneered in the commercial sector can solve a complex biological problem more quickly than conventional approaches—and at a fraction of the cost. This approach to tackling big-data science may signal a potential cultural shift in how basic research can be conducted. You can hear the researchers talk about crossing boundaries to advance research at **hms.harvard.edu/news/solving-big-data-bottleneck-2-7-13.**

Your Source for News

KEEP UP WITH HMS DISCOVERIES and Quad news by accessing the new archive for *Harvard Medicine News*, the weekly electronic newsletter featuring stories about HMS research and the campus community. Download back issues of the newsletter, view the current issue, and sign up to receive it weekly at **hms.harvard.edu/news/publications-archive.**



GENOME EXPRESSIONISM

'Oligopaints' allow researchers to probe virtually any sequenced region

SEQUENCING GENOMES, from those of simple organisms to those of creatures as complex as humans, produces torrents of information that grow as technical advances push down the cost of generating genetic data. But researchers' ability to study the chemical nature of DNA has outstripped their ability to actually "see" chromosomes and their position in the nucleus. Yet knowing how chromosomes fold or stretch is critical to understanding gene expression and also has implications for understanding congenital abnormalities as well as cancer.

A new tool, called oligopaints, may change the imbalance between what can be sequenced and what can be seen. By developing renewable, highly specific fluorescent probes that can "paint" the genome, a research team led by Ting Wu, an HMS professor of genetics, has produced a low-cost, high-resolution method for bringing chromosomes to light. The team reported its findings in the December 26, 2012, issue of *Proceedings of the National Academy of Sciences*.

"There have been some fantastic technologies that have given people a molecular handle on how chromosomes are folded—these involve looking at millions of cells at once," Wu says. "What people are also hankering for is the ability to see every nucleus for itself."

Scientists have long used chemical stains to view chromosomes in the nucleus, but such methods did not provide the precision needed to detect the nuclear arrangement and integrity of individual chromosomes. To light up chromosomes, a paint technique called fluorescent in situ hybridization was developed, but it has remained both laborious and expensive. Wu's lab focused on lowering the cost of painting by employing easily made oligonucleotides, which are short, single-stranded DNA sequences. The probes they developed contain as few as 32 bases, compared to the 100 bases or more of other methods, and can target any sequenced region of the genome along a chromosome. Each oligopaint probe carries single-fluorophore primers, so it lights up at only one point, allowing for greater precision in super-resolution microscopy and image interpretation.

One of the goals of Wu's lab is to make chromosomal analysis as inexpensive as a blood test. Such a test could potentially be used to screen newborns for congenital abnormalities or to guide treatment for cancer patients. The lab has thus far been working in fruit flies and human cell lines, but the principle could apply to any organism, including humans.

—Elizabeth Cooney

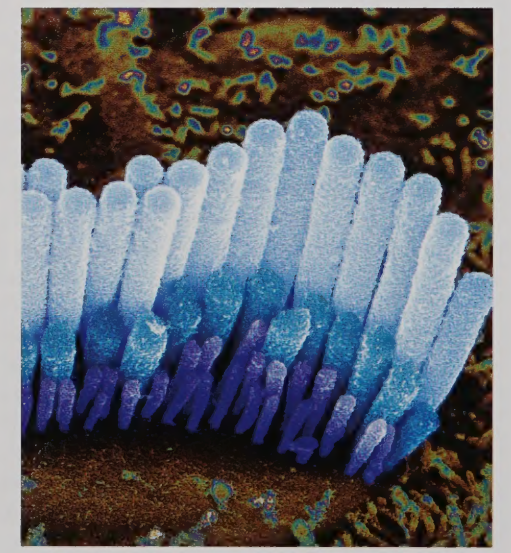
Can You Hear Me Now?

HAIR CELLS, THE FINGERLIKE PROJECTIONS in the inner ear that are so necessary for transmitting sound to the brain for processing and translation, have been regenerated in a mouse model, the first such restoration in an adult mammal. The finding, reported in the January 10 issue of *Neuron* by HMS researchers at Massachusetts Eye and Ear, holds potential for future therapies that may someday reverse deafness in humans.

Hearing loss affects nearly 50 million people in the United States. The most common form, sensorineural hearing loss, is caused by the loss of sensory hair cells in the cochlea or inner ear. Such loss can result from noise exposure, aging, infections, and certain antibiotics and anticancer drugs. Although hearing aids and cochlear implants can ameliorate the symptoms, there are no known treatments to restore hearing because auditory hair cells in mammals do not regenerate.

In the experiment, the researchers applied a drug to the cochleas of mice that had lost hearing owing to noise trauma. The drug, known for inhibiting an enzyme called gamma-secretase, had been selected for its ability to generate hair cells when added to stem cells isolated from the ear. When applied, the drug inhibited a signal generated by a protein called Notch on the surface of cells that surround hair cells. Once freed from Notch's control, the supporting cells developed into new hair cells.

—Mary Leach



BRIAN BELIVEAU, ERIC JOYCE, AND NICHOLAS APOSTOLOPOULOS (FAR LEFT); DR. DAVID FURNESS/WELLCOME IMAGES

Making Adjustments

Anesthesia may trigger cognitive deficits, neuroinflammation

CHILDREN WHO UNDERGO REPEATED SURGERIES that require general anesthesia before age four may be at an increased risk for learning disabilities, say HMS scientists at Massachusetts General Hospital.

In the March online issue of *Anesthesiology*, the researchers report an animal study indicating that age, the specific anesthetic agent used, and the number of doses delivered combine to induce impairments in learning and memory accompanied by inflammation of brain tissue. In a separate report in the same issue of the journal, the team presents findings that the offspring of mice that received a specific anesthetic gas during pregnancy also showed the effects of neuroinflammation and impaired learning.

"We found that different anesthetic drugs—sevoflurane and desflurane—had different effects on neuroinflammation and on learning and memory function in young mice," says the studies' corresponding author, Zhongcong Xie, an HMS associate professor of anaesthesia and director of the Geriatric Anesthesia Research Unit at Mass General.

The researchers found that, when comparing two test groups of young mice, those that received a single two-hour dose of either sevoflurane or desflurane showed neither neuroinflammation nor cognitive impairment. Three doses of the respective drugs, however, caused inflammation and impairment in the mice that received sevoflurane, but not in those that received desflurane. In addition, the researchers also determined two strategies that reduced the negative effects of sevoflurane: pre-anesthesia treatment with an anti-inflammatory drug and placement of the young animals in an environment enriched with ladders, wheels, and mazes.

The second study exposed a group of pregnant female mice to a single two-hour dose of sevoflurane two-thirds of the way through gestation. When assessed a month after birth, offspring of sevoflurane-exposed females showed evidence of impaired learning and memory and elevated levels of inflammatory markers, compared with a control group. As in the first study, placing the anesthetic-exposed pregnant mice and then their offspring into an enriched environment appeared to reduce both the neuroinflammatory and behavioral effects of sevoflurane.

"Six million children undergo surgery each year in the United States," says Xie. "We hope our findings will promote more research into anesthesia neurotoxicity in the developing brain." —*Sue McGreevey*

ISTOCKPHOTO.COM

Name Dropping

Use of generic antiretroviral drugs could bring savings but lessen therapeutic effectiveness

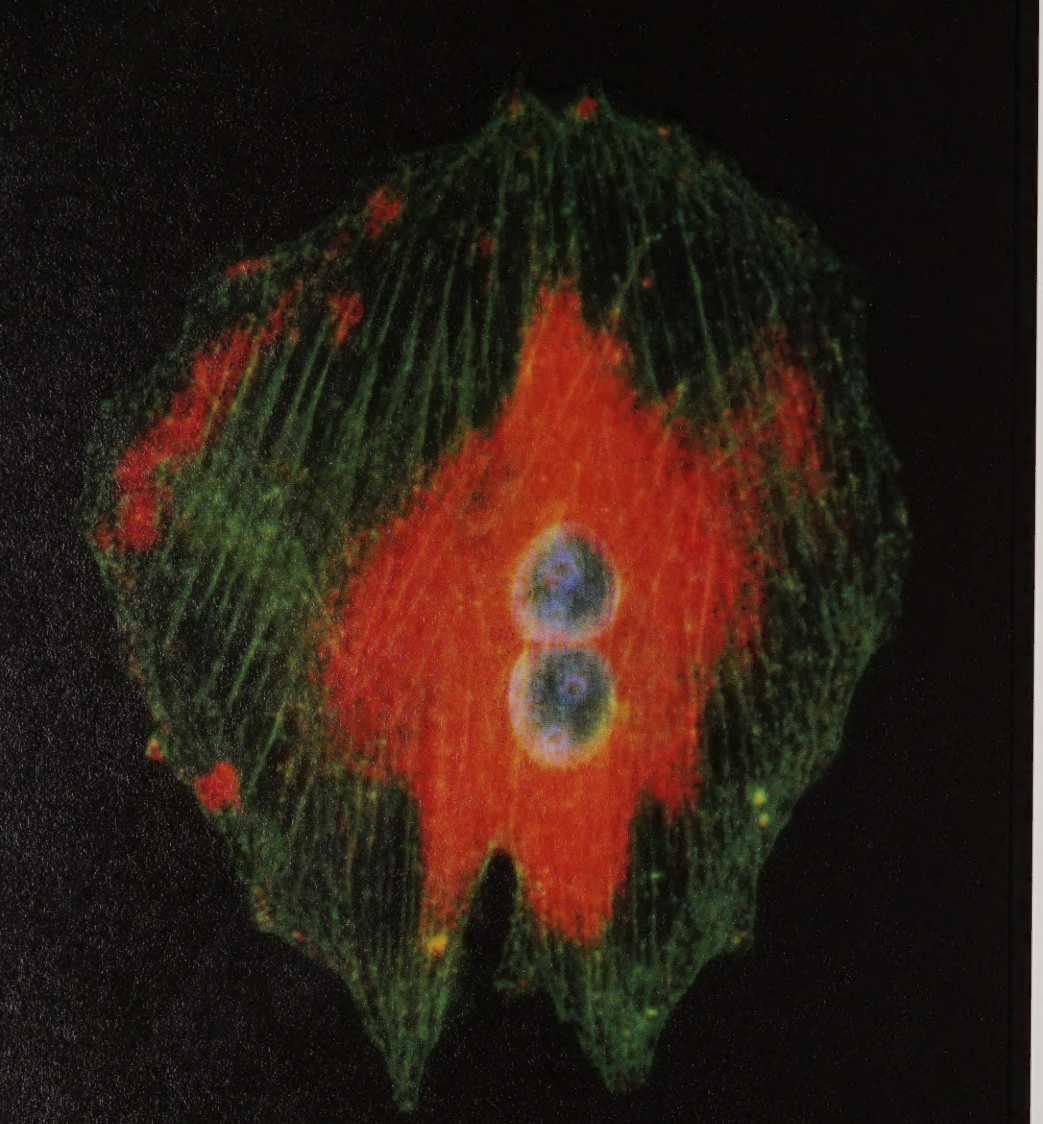
REPLACING THE COMBINATION of brand-name antiretroviral drugs currently recommended for control of HIV infection with soon-to-be-available generic medications could save the U.S. health care system almost $1 billion a year, but may diminish the effectiveness of treatment, say Massachusetts General Hospital investigators. The team, reporting in the January 15 issue of *Annals of Internal Medicine*, examined the potential effect of such a change.

"The switch from branded to generic antiretrovirals would place us in the uncomfortable position of trading some losses of both quality and quantity of life for a large potential dollar savings," says lead author Rochelle Walensky, an HMS professor of medicine and a member of the MGH Medical Practice Evaluation Center.

The currently recommended treatment for newly diagnosed HIV patients is Atripla, a single pill taken daily that combines three brand-name antiretrovirals: Viread (tenofovir), Emtriva (emtricitabine), and Sustiva (efavirenz). A generic form of the antiretroviral drug lamivudine, which has a similar mechanism of action to emtricitabine, became available in January 2012, and a generic version of efavirenz is expected soon.

Replacing two of the three branded drugs with generics could significantly reduce costs, say the authors, but would also have disadvantages. A more complicated treatment regimen, requiring three daily pills instead of one, increases the risk that some patients will miss doses, leading to the loss of antiretroviral effectiveness. Studies have also found that lamivudine may be slightly less effective and more vulnerable to the development of drug-resistant viral strains than emtricitabine.

The team's findings indicate that switching all HIV-infected patients in the nation to the three-drug generic strategy would produce lifetime savings of $42,500 per eligible patient. In the first year alone, the nationwide savings would reach nearly $1 billion. However, the quality-adjusted loss of life expectancy could be as much as 4.5 months. —*Sue McGreevey*



NANCY KEDERSHA/IMMUNOGEN/SCIENCE SOURCE

SOME LIGHT IN THE DARK

Two mutations that collectively occur in 71 percent of malignant melanoma tumors have been discovered in regions of the DNA of cancer cells where cancer-related mutations haven't previously been found.

Reporting in the February 22 issue of *Science*, HMS researchers from Dana-Farber Cancer Institute and the Broad Institute of MIT and Harvard say the mutations may be the most common found to date in melanoma cells.

These cancer-associated mutations are the first to be discovered in the 99 percent of the cancer genome that does not contain genetic instructions for making proteins, a functional absence that has, up to now, led scientists to consider this vast expanse of DNA as "junk." A large number of oncogenic mutations in cancer have been identified in the past several decades, but all have been found within the actual genetic blueprints for proteins.

"This new finding represents an initial foray into the 'dark matter' of the cancer genome," says senior author Levi Garraway '00, an HMS associate professor of medicine at Dana-Farber and an associate member of the Broad.

The mutations affect a promoter region—a stretch of DNA code that controls the rate at which a gene is transcribed—adjacent to the *TERT* gene. *TERT* contains the recipe for making telomerase reverse transcriptase, an enzyme that can make cells virtually immortal, and is often found overexpressed in cancer cells.

The scientists say the same mutations are present in cell lines from some other malignancies, and that preliminary evidence shows they might be unusually common in bladder and liver cancers. The researchers also note that the discovery highlights the value of whole-genome searches of tumor DNA.

A Telling Signature

RESEARCHERS AT BOSTON CHILDREN'S HOSPITAL have developed a blood test for autism spectrum disorders that outperforms existing genetic tests. The test, described December 5, 2012, in *PLoS ONE* and based on the largest gene-chip investigation ever done in autism, could enable early diagnosis of autism in about two-thirds of patients before clear symptoms start to appear. In the United States, the average age of diagnosis is five years.

A research team led by Sek Won Kong of the Boston Children's Hospital Informatics Program looked for differences in gene expression in RNA in blood samples from 66 male patients with autism spectrum disorders and compared them with 33 age-matched males without a disease spectrum disorder.

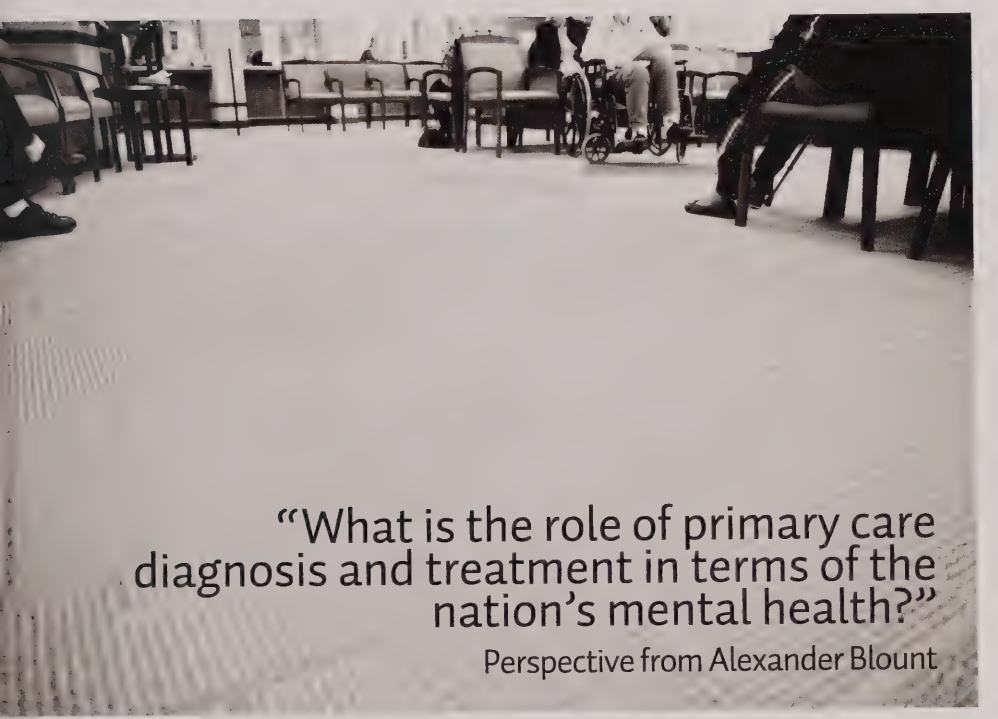
"Since brain biopsy isn't a viable option for research, we asked whether blood could serve as a proxy for gene expression in the brain," says Isaac Kohane, director of the program and senior investigator on the study. "We found that it could."

In their analysis of the blood samples, Kong and colleagues first flagged nearly 500 genes as having distinct expression patterns in the autism spectrum disorder group, then narrowed that group to 55 genes that correctly identified or ruled out autism in 76 percent of samples.

The gene signature approach, which Children's has licensed for development, can potentially diagnose autism far more often than the genetic tests currently available. Those tests look for a variety of autism-related mutations—from small "spelling" changes, to lost or extra copies of a gene or genes, to wholesale chromosome abnormalities. Taken together, however, the known mutations account for fewer than 20 percent of autism cases.

"By looking at this fifty-five-gene signature," says Kohane, "we can say with about seventy percent accuracy that 'this child does not have autism,' or 'this child could be at risk,' putting the child at the head of the queue for early intervention and evaluation. And we can do it relatively inexpensively and quickly."

— Keri Stedman



"What is the role of primary care diagnosis and treatment in terms of the nation's mental health?"

Perspective from Alexander Blount

On average, people with serious, persistent mental illness die 25 years earlier than their peers in the general population.

PRIMARY CARE behavioral health services, which embrace mental health, substance use, and health behavior change, are the foundation of the nation's mental health care system. More mental health care is rendered in the primary care setting than anywhere else, including mental health care settings. Here we find enormous numbers of common mental and substance use disorders that are neither simple nor minor. Since most patients are unwilling to accept a mental health referral outside the primary care setting, these problems are addressed in primary care, or not at all. Yet, when the primary care practitioner is the only behavioral health provider, treatments are marginally effective and often frustrating to patients and providers.

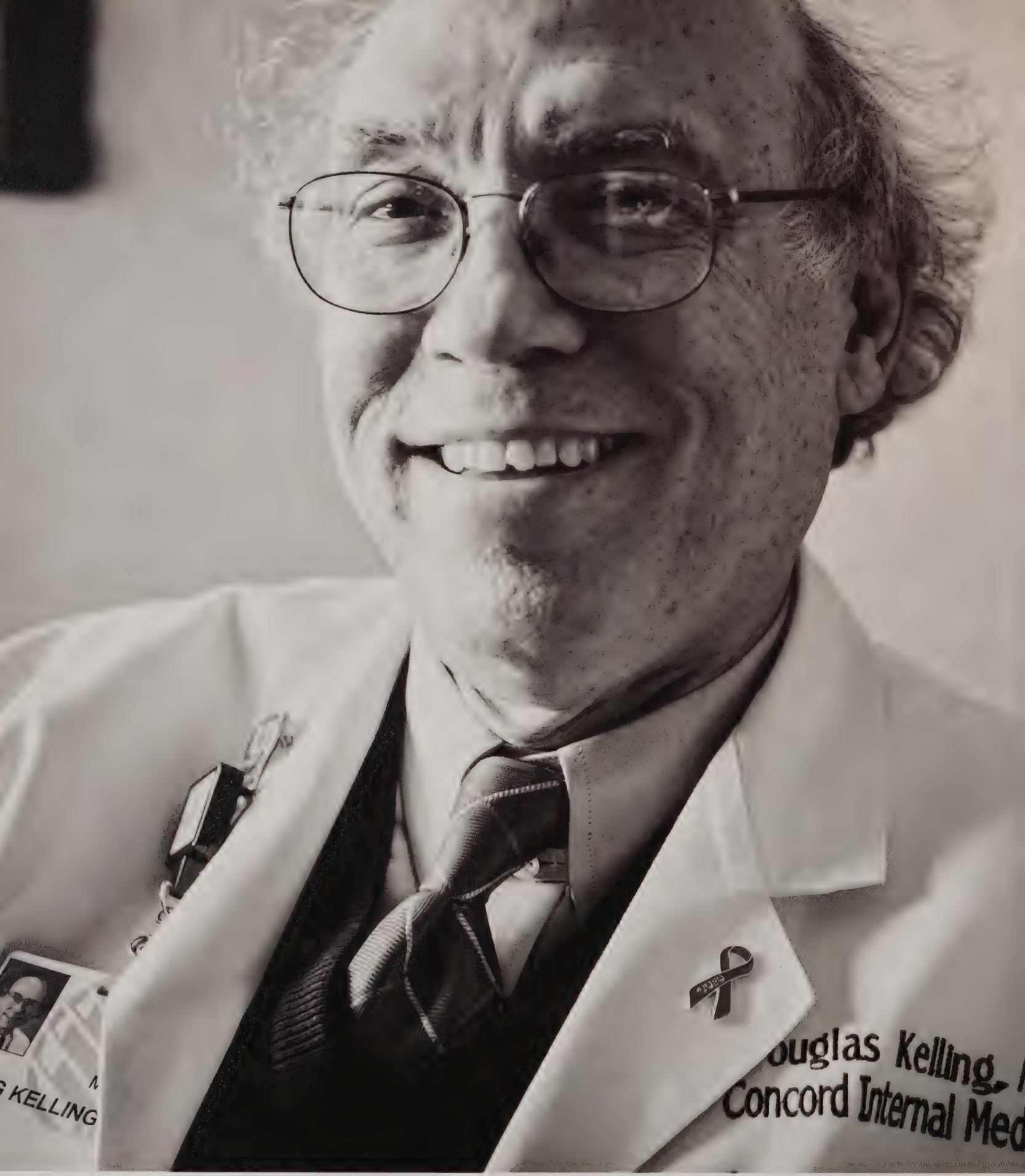
When services are available from a mental health professional who is part of the primary care team and is trained to provide primary care behavioral health, access improves, treatment courses shorten, health behaviors can be addressed earlier and more effectively, and race- and culture-based disparities in care are reduced. In addition, it is comparatively easy and convenient to use the primary care setting to screen for depression, anxiety, PTSD, alcohol and substance use, and domestic violence. Most chronic illnesses are identified and treated in primary care, ideally with close coordination and support from specialty services for difficult or complex cases. For the vast majority of patients, the same model is proving relevant for mental health and substance use disorders.

For a few people, usually those receiving long-term treatment for serious and persistent mental illness, a mental heath setting is more comfortable and accessible than a primary care setting. Yet ensuring this population has access to primary care is vital; on average, people with serious, persistent mental illness die 25 years earlier than their peers in the general population. Locating primary care services in mental health centers could improve the health of this population and help bridge the divide between mental and physical health service delivery. This change has been transformative for the mental health centers where it has been implemented.

The rising cost of health care is squeezing the nation's employers. It also has set the stage for new aggregations of cost data, showing that when the loss of employee productivity is added to the cost of health care and medications, depression is the most costly illness for employers. New approaches to payment, spurred by leading employers and the Affordable Care Act, are making it financially possible to broadly implement the integration of behavioral health and primary care. The growing evidence for increases in clinical effectiveness, long-term cost reduction, patient and provider satisfaction, and improved access should keep the evolution toward integration continuing for the foreseeable future. ■

Alexander Blount is a professor of clinical family medicine and psychiatry and director of the Center for Integrated Primary Care at the University of Massachusetts Medical School in Worcester. He also is editor of Families, Systems & Health, *a journal of the American Psychological Association.*

ANNEMIE TONKEN; ALEXANDER BLOUNT (FAR RIGHT)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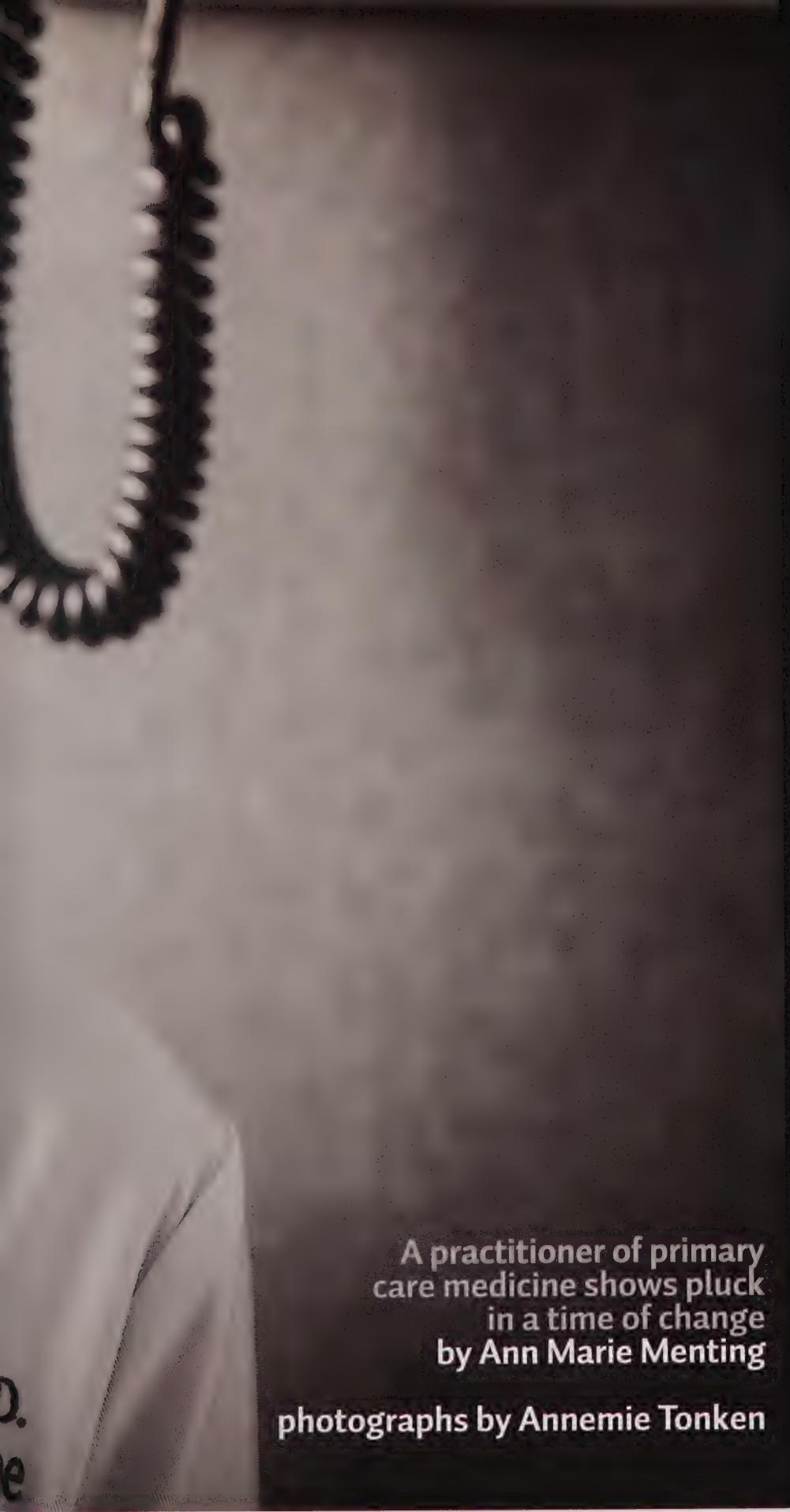


The Doctor Is In [Transition]

A practitioner of primary care medicine shows pluck in a time of change

by Ann Marie Menting

photographs by Annemie Tonken

On a recent winter morning, twilight was moving to dawn as Doug Kelling '72 made his way to the bedsides of his patients at the Carolinas Medical Center–Northeast in Concord, North Carolina. On this day, as on all weekdays, Kelling arrived at the hospital around 5:30 a.m. and would remain at the medical center until 10 p.m. During those hours, he would confer with his team of health care professionals; respond to inquiries from physicians, staff, and patients; monitor the operation of his clinic; tangle with the computer system; wade through paperwork, and, of course, do what Kelling, an internist and a pulmonologist, is trained to do—diagnose, assess, and treat his patients, those in the hospital and those in the clinic. He'd also shoehorn in time for lunch and, around 7 p.m., would head home for an hour for dinner with his wife, before returning to the hospital. Weekends he works only seven hours each day.

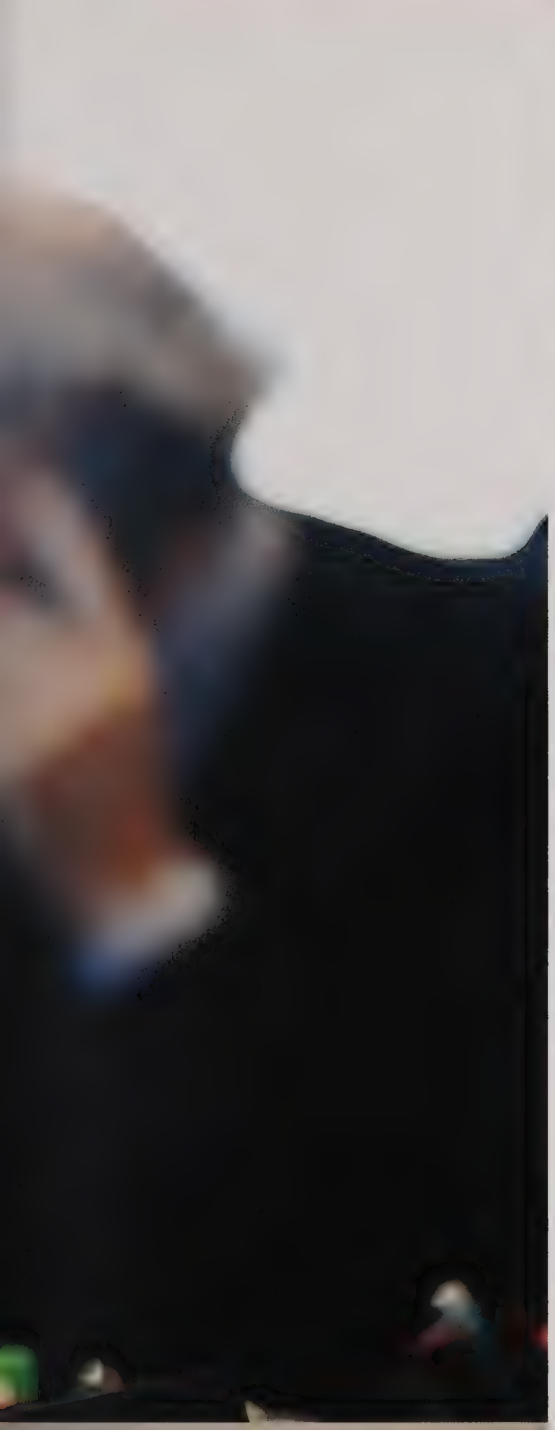
SO HERE'S MY NUMBER: A likeness of Doug Kelling, carved by a grateful patient, occupies a spot of honor on Kelling's desk. Such care and commitment is matched by that of Kelling, nurse manager Lynn Bailey (top, right), and their primary care team. Kelling amplifies the team's commitment by providing each of his patients with his office, home, and hospital telephone numbers.

Kelling's work week is the tip of an iceberg of demands facing today's primary care physicians. These physicians are the first, and often abiding, face of medical care for their patients, serving as advocates for access to the health care system and providing a range of services that includes the diagnosis and treatment of acute and chronic ailments, prevention strategies, and health education.

In this nation, the primary care physician's patient population is made up largely of an escalating number of elderly who suffer from multiple chronic conditions. And soon that population will gain an estimated 32 million Americans, beneficiaries of the Affordable Care Act.

This deep river of need, however, is being served by a narrowing stream of practitioners, choked on one side by attrition and on the other by meager recruitment, each a function of the profession's demands and the knowledge that compensation for time and caregiving is often inadequate.

To stay in the field, then, presents a daunting prospect. But Kelling and a like-minded cohort of his peers are not only staying, they are actively introducing innovations to their practices, reforms that they hope will meet or surpass the challenges presented by the communities they serve and by the nation's health care system in general. These physician innovators aim to devise



new systems that can remain resilient in a changing landscape of primary care while also improving the delivery of that care—and the culture of the profession.

Terry No More

Although Kelling is the first to admit that the changes he made to his practice may not represent the model for primary care—"If you've seen one medical practice model, you've seen one medical practice model"—he does think that the system his team uses serves the people of Concord well. It delivers comprehensive, coordinated care that focuses on the long-term needs of each patient and each patient's family.

Meeting Kelling's patients brings you face-to-face with the evolving population of North Carolina's Piedmont region. Although the practice primarily serves patients who qualify for Medicare and Medicaid, it also serves private-pay clients. Some patients are new to the group—unlike a lot of overstretched practices, Kelling's remains open to new patients—but many, ever so many, have been coming to see Kelling for generations.

"This is a loyal, close-knit community," says Kelling, "but it's not a closed community; we see about 50 new patients a month. People who've grown up here often have their parents and their children living here. It's not uncommon that when the parents are satisfied with the care they receive, or the grandparents are satisfied with the care, they'll want their children and grandchildren to receive that care."

The community's cohesiveness owes much to its roots as a textile town. The site of the second mill for what was then the towel-making Cannon Manufacturing Company, Concord and its residents benefited from the vision of Charles A. Cannon, son of James W., the company's founder. Homes, schools, churches, all were built by the company for the workers and their families. Even care for the workers' physical health was a part of Cannon's plan for the community; the firm's ledgers describe a site where the company's workers received medical care. That site, known as Plant 13, has developed into the current medical center complex.

For more than a century, the residents of Concord and its environs wove tight bonds inside and outside the factories. Then a series of changes in ownership and a shift in the nation's manufacturing climate brought it all to a halt: in 2003, the last owner declared bankruptcy. A single factory that had employed 47 percent of Concord's population was shuttered after one month's notice.

"People lost their insurance," says Lynn Bailey, a registered nurse who manages the practice's clinical and hospital arms and has lived in the area since 1983. "They had no way to pay for medical care, no way to get their medications. Grandparents were raising

grandchildren and were making choices between rent and food and medications. Noncompliance snowballed and more and more people became sicker and sicker."

Electronic Shock

To meet the community's needs, throughout the past three decades, Kelling has systematically customized his operation. He has assembled and implemented a team-based approach to caregiving, crafted protocols that codify and unify procedures for oft-seen chronic conditions, developed a drug dispensary to ensure patients access to medications, served as a mentor to medical students and students of other health professions who intern with him, and moved medical records and metrics related to caregiving to an electronic platform.

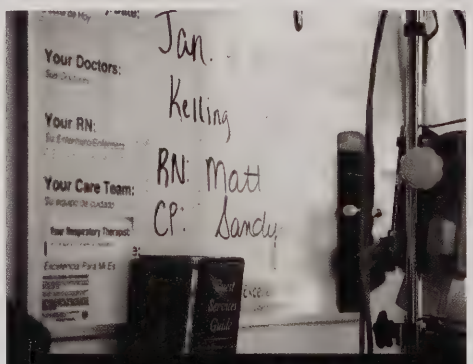
Although the latter change is seen by many as vital to efforts to reform how medicine is delivered, care outcomes are monitored, and efficiencies are found, the practice's shift to electronic medical records has not been without headache. The team successfully migrated all patient records, which, according to a recent poll, places the practice among the nearly 18 percent of U.S. primary care practices that have done so. And team members have become proficient in using the system, dictating directly into it using voice-recognition software. Yet, the computer system's reliability is uneven—up and down three times in one day, for example—and that, according to Kelling, is not the worst of it.

"I would have to say that information technology is really very primitive," says Kelling, who once programmed computers. "It slows us down. It's not logical in terms of how fields are structured, and it's clearly not designed by people who understand workflow. Right now, it's cut our efficiency by 25 percent. We have good numbers on that."

Parts of the Whole

Achieving this or any sort of procedural overhaul requires staff and coordination. When Bailey joined the practice 14 years ago, there were about 15 employees, including Kelling, a second nurse, and two physician assistants. Today, according to Bailey, the practice has seven nurses and is "fifty-five staff strong." In addition to Bailey and Kelling, the lineup includes clinic physicians Carmella Gismondi-Egan and George Monroe; six physician assistants; three doctors of pharmacy (PharmDs); registered nurses who "run with" the doctors as they see patients to ensure all physician orders are captured and all tests arranged; a case worker; patient service representatives for checking patients in and out; certified medical assistants for bringing patients to the exam rooms, taking vital signs, and gathering appointment-related information for the doctors; and a staff member who refills medications according to relevant protocols. The clinic serves between 12,000 and 13,000 patients, and there are approximately 30 beds in the hospital unit Kelling oversees.

"The size of our patient population would be significant," says Kelling, "if you discussed it from the standpoint of the number of doctors we have: three. But if you take a team-based approach, as we have, it's much more manageable."



TOWN SQUARE: Activity at the Medical Arts building of the Carolinas Medical Center–Northeast is high from dawn to dusk as members of the Concord, North Carolina, community seek care from its physicians. Loyalty to the physicians runs deep, especially among the patients (facing page) of Doug Kelling and his team.

Summing the Parts

The team-based concept calls for using health care professionals to augment the capacity of physicians. As in Kelling's practice, these so-called extenders can be case managers, physician assistants, nurse practitioners, pharmacists, nutritionists, or any professional whose licensure allows them to deliver specialized care independently, under the guidance of a physician.

Bailey says the work of these extenders is dictated by "common sense and their

compassion to take care of our patients," as well as by a body of disease protocols that Kelling has developed over the years.

"When I joined his practice," says Bailey, "he had developed the first protocol—it was for diabetes. Now there are fifteen different disease process protocols, these flow diagrams, that all tie back together. We use them for all disease types, some being COPD, diabetes, asthma, anemia of chronic disease, hypertension, chronic kidney disease, mental health, osteoporosis, whatever our patients present with. This means that the staff nurses, the clinical nurses, the clinical staff, and the nonclinical staff have the ability to do what they need to do to take care of the patient. They know what is expected and how to do it."

The team's PharmDs, for example, manage the 300 or so patients taking coumadin, performing the diagnostic fingerstick, determining drug levels in the blood, and regulating dosage—all determined by Kelling's protocol. They also see the practice's 1,200 patients with diabetes, teaching each how to monitor glucose levels, administer insulin at the dose needed, and use an insulin pump. The half dozen physician assistants see patients and take histories; review lab work, diagnostic tests, and X-rays; and, based on protocols, make recommendations for treatment.

Other team members coordinate care outside the clinic. Three discharge planners help arrange home health care or placement in nursing or rehabilitation facilities; a case worker assists in organizing transportation, filling out insurance forms, and stocking home pantries; and a medication coordinator sees that patients who can't afford their prescribed drugs can obtain them from pharmaceutical firms. All patients within the Carolinas HealthCare system, the medical center's parent group, benefit from this medication assistance program. Another service, also spurred by Kelling's efforts, is keyed to the needs of his clinic's patients.

Even before the town lost its principal employer, Kelling had been meeting with pharmaceutical reps, learning about new medications, and cultivating relationships that he later leveraged into support for an in-clinic pharmacy of drug samples. The tangible results of his campaign can be found in a closet at the clinic, one outfitted with movable floor-to-ceiling shelves holding small plastic bins, each neatly labeled with the name of the drug that fills it. Throughout the day, small brown paper bags containing prescription medications travel from closet to waiting patients' hands, then out the door. The samples serve to tide patients over until a prescription, or an application for prescription assistance, comes through.

These are professionals who love their jobs, who are committed to primary care medicine, yet who understand all too well its demands.

Prime Time

Observing Kelling's practice, it's hard not to wonder whether it can be sustained in the coming years. The day-to-day demands seem to grow exponentially. Listening to Gismondi-Egan, Monroe, and Kelling talk about what they must cover during the course of a clinic visit, the so-called metrics of a visit—a short litany includes reviewing guidelines for disease, weight management, smoking cessation, pain control, health literacy, vaccination, advance directives, preventive screenings, medication dosages, lab results, and working with patients on their health-related decisions to ensure that those decisions are informed—a submerged current of dismay is evident. These are professionals who love their jobs, who are committed to primary care medicine, yet who understand all too well its demands. The fact that they are part of a team brings them solace and hope. But each voices worry about the field's future. Will there be new doctors to care for the coming generations of patients? Will there be primary care practitioners to take care of them? As might be expected, the team is innovating on this front, too.

For about a decade now, the practice has hosted physician assistants, nurse practitioners, and medical students for 10-week rotations, half spent on the hospital side, half in the clinic. The interns experience

THE ART AND THE SCIENCE: Teaching the next generation of caregivers is an important aspect of Kelling's practice, and it often hosts students for multiweek rotations. Another aim of the practice, to ensure no one goes without needed medication, led to an in-clinic supply of drug samples (left) distributed as necessary to clinic patients.

VIDEO

Primary Care in Practice:
An internist's perspective
hms.harvard.edu/harvard-medicine

day-to-day internal medicine and learn at Kelling's side. "He teaches without teaching," says Bailey, "with everything you do and everywhere you go, you learn from him."

The practice has established affiliations with some schools in North Carolina, but has also drawn from schools in New York, Alabama, Georgia, and Mississippi. It has even brought in students from overseas.

That Human Touch

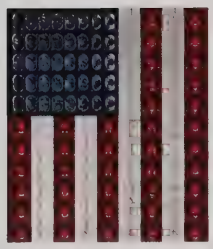
Kelling thinks that one way to encourage medical students to enter primary care is to train them to be team leaders, to prepare them to supervise 15 to 20 health care professionals, to teach them what they can do, and, just as important, what they can't do within the changing landscape of the field.

"We need to train primary care physicians that it's their job to coordinate their patients' care," says Kelling. "Health care is now so complicated and complex that I think patients feel strongly that they've got to have an advocate. I think if primary care is ever going to have an identity again, it's got to recognize that one of its strongest suits is being an advocate for the patient in terms of different treatments, different medications, different opinions, and different options."

A century or more ago, primary care medicine *was* medicine. Physicians were entrepreneurs who had some training in the medical arts, and they served their clientele privately and personally. They visited homes to diagnose and treat, sometimes staying for hours or days to deliver babies, care for sick children, or see to the needs of the frail and the elderly. It was care undertaken in partnership with the patient and his or her family, and conducted within a community.

These fundamentals of the art remain unchanged even amid the challenges that confront today's primary care physician. "We want to help people," says Kelling, "we want to make them feel better in any way we can. Ours is a humanistic approach." ■

Ann Marie Menting is editor of Harvard Medicine.



Primary School

The new HMS Center for Primary Care brings leadership, innovation to a field in flux

interview by Jake Miller

Launched in October 2010 with a $30 million gift from an anonymous donor, the HMS Center for Primary Care is taking on the challenge of transforming primary care medicine, improving the training of the field's practitioners and leaders, and supporting the development of innovative systems in health care delivery. The Center represents a vibrant community of students, faculty, allied health professionals, and staff at its affiliated clinical sites.

In this interview, Russell Phillips, the Center's director and the William Applebaum Professor of Medicine at Beth Israel Deaconess Medical Center, and Andrew Ellner '04, Center codirector and an HMS instructor in medicine at Brigham and Women's Hospital, talk about primary care, family medicine, and the overall goals of the Center.

CARE COLLABORATIVE: The HMS Center for Primary Care, led by Russell Phillips (right) and Andrew Ellner, taps a wide network of talented professionals keen on improving the delivery of primary care medicine.

JOHN SOARES

Q: What role do you and others at the Center hope HMS will have in shaping the future of primary care?

Phillips: We would like the School to take a leadership role in the coming transformation of health care. To help make that happen, the Center will focus on leading a redesign of both primary care practice and education at HMS.

Q: Creating effective teams seems to be essential to the redesign of primary care. Why is the team approach so critical?

Ellner: One big driver is the need to make the work of primary care doctors more sustainable and more joyful. Primary care has been a hard specialty to practice, with an increasing number of expectations of what could or should be done for patients within the primary care setting. Innovations in the way care was delivered grew out of a need to find new ways to meet these increasing demands. One area of innovation focused on changing the delivery of care so that it wasn't so dependent on the individual physician, but instead involved a team. This has influenced thinking about teams of providers working with individual patients, and about looking across populations of patients to be more efficient or effective in the way a clinic or a practice serves a group of people.

Q: I understand the Center also is interested in growing the family medicine presence at HMS. Why?

Phillips: From my perspective as an internist, family medicine has placed greater focus on the whole person, on improving communication skills, and on changing health behaviors. And because family medicine physicians take care of the whole family, they have perspectives on adults of all ages and on children, on family and community dynamics, and on the relationship between families and health. It's an approach that fosters a different skill set from internal medicine or pediatrics and brings a valuable perspective to the primary care workforce.

Q: HMS has not traditionally offered opportunities in family medicine to its students. Do you anticipate this will change?

Phillips: I do think this will change. We are talking to leaders at our affiliated teaching hospitals and soliciting their interest in creating a training program in family medicine. It's our hope that one or more of the affiliates will be interested in creating an academic department or division at their hospital, with the possibility of starting an academic department in family medicine at HMS eventually. We have a new $2 million gift from an anonymous donor and anticipate putting out a request for applications to leverage that gift to create a family medicine training program.

Q: Are the changes to health care being introduced by the Affordable Care Act helping to drive this interest?

Phillips: Interest in incorporating primary care and family medicine into the School's curriculum had been growing before these changes, but the requirements of the Affordable Care Act have definitely helped. Most of our academic medical centers are now part of accountable care organizations. Under the new payment models for ACOs, a network's success will depend on its ability to manage the health of large populations of patients, so a network's primary care base will be an important strategic element for its success and survival. Our affiliates are focused on the question of who their primary care doctors will be in the future. They're also interested in learning how to manage a primary care practice to keep patients healthy and to avoid unnecessary spending.

This transformation in health care really is a complex challenge. It's long been thought, for instance, that if you addressed a patient's primary illness, you would prevent readmissions. But it turns out that someone who is admitted to the hospital for one thing has an increased risk of being admitted for a lot of other problems. So it's not just that you need to treat the heart failure a person is admitted with, you also need to treat the general chronic illness and deal with the patient's social system.

Q: On a day-to-day basis, how will hospitals need to change the way they function?

Phillips: Under the old fee-for-service model, if a patient was repeatedly admitted to the hospital, the hospital would collect fees over and over again. With accountable care, the hospital might get a set fee per year for each patient. This change will provide a strong

Russell Phillips

As part of the team care approach, patients can be empowered to monitor their own health, and they can receive the support they need to sustain their efforts.

JOHN SOARES (THIS SPREAD)

financial incentive to keep patients healthy and out of the hospital.

Let me give you an example of this sort of situation. I was making rounds recently as a visiting professor. We saw a patient with diabetes that was so out of control that he was admitted. He was also homeless and had a drug addiction.

That patient was going to go back to the streets, and without question, was going to be readmitted. That sequence of events would not be the result of the hospital staff's inability to provide medical care—the diabetes could be managed, the addiction could be managed—but under the old fee-for-service system, there were not the resources to help this patient break that cycle, to prevent him from coming back to the hospital, acutely ill and in need of rescue care to save his life.

Ellner: Someone like that patient might be hospitalized 30 or 40 times a year. If you consider the cost of those hospitalizations, it's certainly less expensive to have the patient served by a primary care team that includes a social worker, a pharmacist who reviews the medicines regularly, and a nurse care manager who helps manage and coordinate care. The new payment models will make that kind of coordinated care possible.

That's better for everyone. It's better for the patient, who gets help to stay healthy. It's better for society because it's bringing costs down. It's also a completely different experience for the physicians involved in the care; they suddenly experience what it's like to be part of a team of caregivers. I've seen that transition in my clinic in the past two or three years, and it is such a dramatic change. As a provider, working alone, you can feel helpless and terrified when caring for patients who have so many challenges in their lives. Now, my patients with multiple chronic illnesses and complex social constraints have a team that includes a nurse care manager involved in their care. And every member of the team communicates with other members by email, keeping all of us involved and informed.

Q: That's an interesting example of using technology to solve a problem. And it's not some radical new high-tech advancement. It's just email.

Phillips: Sometimes we just need to find ways to get simple tools into the right hands. For example, we conducted a heart-failure readmission prevention program, and we found that what helped most was giving the patients bathroom scales so that they could monitor their weight at home. We just went out and bought them scales.

Q: But is it enough for patients to just have access to tools so they can collect data and monitor their own health?

Phillips: Not at all. As part of the team care approach, patients can be empowered to monitor their own health, and they can receive the support they need to sustain their efforts. Take the homeless patient with diabetes we mentioned. In an ideal situation, if I saw that patient in my practice, we would have a care manager assess the patient's needs before he left the hospital, probably bring in a social worker or a community resource specialist to assist the patient with temporary housing or other social safety net supports, and ensure that a substance abuse counselor talked with the patient as well. For high-cost, repeat-visit patients, the solution isn't always more visits to the doctor and more tests. It may be something as simple and straightforward as installing an air conditioner in the house of a patient with asthma so that she has better air quality. Or buying a patient a scale.


Andrew Ellner

Q: Such a complete transformation of the way health care is paid for and medicine is practiced would seem to present a daunting challenge.

Ellner: It does, but one of the exciting things for us as a faculty is to see that the challenge will be tackled by the talented, motivated students who are electing primary care medicine. These students are interested in fixing health care, and in understanding how to make complex systems work better. It's probably the most inspiring part of our job to not just work with such students, and to remove barriers so that they take the lead on creating solutions, but also to learn from them.

It's also exciting to know that we're not only working with the School and the affiliate hospitals, but also with the broad resources of the University. In the first cohort of our Agents of Change project, we have a new group of medical students working in teams with folks from Harvard's graduate schools for business, education, and public health to propose innovative solutions to problems that have been identified by the professionals in community health centers in Boston.

Phillips: That's one part of a larger program that the Center is launching to foster innovation and to develop new approaches to how care is provided, including technologies and processes that support population management and better care coordination, and tools to help patients participate in their own care.

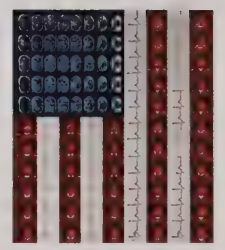
The Center has had great success with its Innovation Fellows program, which creates protected time for primary care faculty at the affiliate hospitals to promote care delivery innovations and cross-disciplinary collaborations, and to serve as mentors.

We don't know what health care will look like in the coming years, but it's clear that primary care team work and collaboration will be a central part of any change. It's exciting to see HMS students and our colleagues laying the foundation for that transformation. ■

Jake Miller is a science writer in the HMS Office of Communications and External Relations.

Amid the swirl of changes that challenge obstetrics today, one thing remains the same—the pure joy of delivering babies

by Ellen Barlow



With Child Within America

The Second World War was nearing its end when John Rock, Class of 1918, and Miriam Menkin, his laboratory technician, completed a six-year study that showed, for the first time in history, that a human egg could be fertilized outside a woman's body. Rock, then an HMS clinical professor of obstetrics and gynecology and a fertility specialist at the Free Hospital for Women in Brookline, Massachusetts, had long studied infertility in women. Though it would be decades before anyone even attempted to implant a fertilized egg into a woman with reproductive problems, the possibilities of Rock and Menkin's work were not lost on the scientific community—or the public. By 1978 in England, there was indeed a baby, Louise Joy Brown, born as a result of successful in vitro fertilization.

BE PREPARED: During his tenure with the Indian Health Service, Nathaniel Cobb occasionally had to depend on moxie and make-do when resources were slim but babies were ready to be born.

"Test-tube baby" thus entered the lexicon, symbolizing changes in both reproductive technology and the practice of obstetrics. When Laurie Green '76 was an obstetrics resident at the University of California, San Francisco, it was big news when a 37-year-old athlete became a first-time mother. Then Louise Brown was born. "Obstetrics had been a high-touch, low-tech specialty," says Green, "but technology pushed the envelope so that women who previously couldn't dream of pregnancy were able to become pregnant. The field was turned on its ear."

Yet while technology has brought new hope and fresh worries to obstetricians who serve populations that can tap its promise, other physicians, those who serve the 20 percent of Americans who live in a rural setting, confront a different problem: there's simply not enough of them to go around. These tensions pull at pregnant women and their caregivers—and HMS physicians seek to allay them.

Pregnant Pause

Green, a founding partner of the Pacific Women's Ob/Gyn Medical Group in San Francisco, has been delivering babies for 30 years. In contrast to the late 1970s when it was unusual for Green to have pregnant women in their late thirties as patients, the average age of women now delivering at California Pacific Medical Center, her tertiary care hospital, is 35.

Throughout the past two decades, birth rates, or the number of births per 1,000 women, have increased for women age 35 and older, an uptick linked in part to fertility-enhancing technologies. Older-age pregnancies, says Green, increase the chance of pregnancy-related complications such as diabetes, high blood pressure, preeclampsia, chromosome abnormalities, and the necessity of a cesarean delivery.

There are additional risks facing those who become pregnant through assisted reproductive technologies. Recently, for example, Green performed a cesarean delivery eight weeks early for a woman pregnant with mono mono twins—twins in the same sac with the same placenta—a condition that often results in stillbirth. Another patient she was monitoring closely had mono di twins, who share a placenta but have two separate sacs, a result of one embryo cleaving. Although these kinds of twins are very rare, throughout the past 20 years, the incidence of twinning has doubled, largely as a result of assisted reproductive technologies such as ovulation induction or in vitro fertilization. Twins experience more problems than singletons during delivery, but those twins originating with assisted

SARAH COBB

The Stork Club

Average number of births per week: **76,911**

Number of cesarean deliveries in an average week

Number of preterm births on average per week: **9,208**

Number of low-birthweight babies,

technologies have even higher rates of preterm births and cerebral palsy.

"Within the context of this extremely complex obstetrics population, we have women who walk in with specific ideas about what they will and will not permit as part of their birth process," Green says, adding, "many of these older women are going to need interventions and a hospital, but they're wavering." Some even want to give birth at home. She speculates that societal changes in women's perspectives of themselves may have engendered expectations that the uterus is ageless and will perform as well at age 40 as it does at age 20.

Green finds herself also managing women's expectations for the birthing process. The practice of obstetrics has become more complex and difficult, she says, but with advances in research and technology, "we have become more adept at handling pregnancies that twenty years ago would have been considered high risk."

MATTIAS PALUDI

Labor Intensive

There are few hospitals as synonymous with technology and innovation as Massachusetts General Hospital, with its extensive infertility program and world-class experts on every high-risk pregnancy-related condition imaginable. If, for example, a fetus has a mass blocking her airway, a multidisciplinary team of surgical and pediatric specialists can deliver the baby while using the mother essentially as a heart-lung machine until a breathing tube can be inserted.

When the hospital was founded in 1811, however, it did not offer obstetric services. After all, its founders reasoned, "respectable married women" gave birth at home. Except for a brief attempt in the 1950s, it was not until 1994, spurred by Isaac Schiff, now the HMS Joe Vincent Meigs Professor of Gynecology and the hospital's chief of the Vincent Obstetrics and Gynecology Service, that a multidisciplinary obstetrics service was created and sustained.

Schiff had noted that the neighborhood health centers the hospital owned in Chelsea, Revere, and Charlestown did not provide obstetric care to these largely poor patient populations. The women instead had to go to other hospitals to get prenatal care and to deliver their babies. "I found that disturbing," comments Schiff, who, with a team of colleagues, built a program in obstetrics at Mass General starting with deliveries for women who came in from the neighborhood health centers.

One of Schiff's goals was that each and every patient would receive the same standard of care. The hospital agreed.

25,177 Deliveries by Certified Nurse Midwives, one week's estimate: **6,000**

on average per week: **6,261** Births to women over age 35, a week's estimate: **11,000**

FOR ONE AND ALL: In the early 1990s, Isaac Schiff helped to successfully establish an obstetrics service at Massachusetts General Hospital that would serve all women regardless of means.

JOHN SOARES

Women in rural areas have depended on family practitioners trained in obstetrics to deliver their babies, but now nearly four out of every five family physicians do not provide obstetric care.

"This program," says Schiff, "is quite different from a lot of the programs in obstetrics across the country where the poor or those on Medicaid are treated by one group of doctors and private-pay patients by another group."

Another founding principle is collaborative care, with nurse-midwives as an integral part of the team. About one-third of all deliveries at Mass General are performed by nurse-midwives. "The patients of midwives are delivered by a midwife," says Schiff. "If a problem develops, there are physicians 24/7 who can intervene."

Rural Delivery

When the lens focusing on care delivery shifts from urban hospitals to facilities in rural settings, a different picture emerges. "There is a huge problem in rural America in delivering obstetric services," says Kenneth Bollin '76, chief of family medicine at St. John Hospital and Medical Center in Detroit. He has seen firsthand the disparities in availability of care between urban and rural settings. Rural populations are scattered over great distances and residents typically travel many miles to get to a community hospital, let alone one that has the obstetricians and surgical facilities required for complicated deliveries.

Plus, "most physicians are trained in urban settings and tend to gravitate to them to practice for lifestyle and cultural reasons," says Bollin.

Fewer obstetrician-gynecologists and family physicians are practicing obstetrics. Why? Two reasons are most common: the disruption to lifestyle caused by 24-hour

on-call shifts, and the cost of malpractice suits, including high insurance premiums and the personal and professional toll of such lawsuits. Women in rural areas have depended on family practitioners trained in obstetrics to deliver their babies, but now nearly four out of every five family physicians do not provide obstetric care.

As a family practitioner, Bollin delivered babies for 25 years in a rural area in the thumb of Michigan. The nearest hospital, one with 65 beds and one staff obstetrician, was a half hour away by car. Bollin was the first family practitioner in the area, sent there to fulfill the service requirement of his National Health Corps scholarship. He stayed and built up a five-physician family practice that delivered half the babies in the community. At the time, the obstetrician in the area was not pleased to have a family physician delivering babies, but today obstetricians and family physicians share birthing responsibilities at the small district hospital.

Continuity of care typifies family medicine and obstetrics should be part of it, Bollin says. When he finished his family medicine residency at the University of Iowa, 45 percent of family medicine doctors in the United States did obstetrics as part of their practice. By 2010, only 10 percent did. On top of that, there has been a dramatic drop—87 percent in 1985 to 50 percent by 2002—in the number of hospitals in remote areas that offer obstetric services. The result is that more than one-third of U.S. counties lack hospital-based obstetric services.

Such statistics have helped generate a big debate in family medicine, notes Bollin. "The American Board of Family Medicine mandates that every family physician be trained in obstetrics in a residency program by a family physician who does obstetrics. But only half of all residencies are meeting the appropriate numbers or giving the appropriate experience."

For example, during his training, Bollin delivered more than 200 babies and did enough cesarean deliveries to become certified to perform them, too. "Now, to finish family medicine, you have to deliver only 40 babies," he says.

In Service

The story of rural care changes somewhat when a different model of health care comes into play. American Indians who live on or near reservations have a single-payer health care system, the Indian Health Service, financed by the U.S. government. The Indian Health Service model, according to Yvette Roubideaux '89, the Service's director, provides all American Indian and Alaska Native women with some level of access to prenatal care and delivery services.

And that care is free. Working within its limited budget, the Indian Health Service uses a team-based primary care system to care for about 2 million of the nation's 3.4 million American Indians and Alaska Natives. Its regionalized system consists of more than 600 clinics, hospitals, and health stations located in or near rural reservations. For the care of urban populations of American Indians, the Service either contracts with urban Indian organizations or purchases care from urban hospitals for services for eligible individuals.

Prenatal care is provided to pregnant women at a primary care facility closest to where they live, and deliveries are performed at the nearest hospital, if those services are not available locally. If there are complications, women can be transferred to an appropriate facility by ambulance, helicopter, or, in remote areas of Alaska, by plane. Telemedicine programs also are used to extend and enhance care.

Despite the infrastructure in place, there are economic and cultural obstacles that affect care delivered to pregnant women on reservations. Many times, low-tech inspiration must take the place of high-tech innovation.

Nathaniel Cobb '84 knows what it's like to depend on moxie and "doing what you can with what you have." For two decades, he was chief of the Chronic Disease Branch of the Indian Health Service, while also maintaining a part-time clinical practice near his home in New Mexico. But for the three years that followed his family medicine residency at the University of New Mexico, he worked at the Zuni Indian Hospital on the New Mexico–Arizona border.

Cobb tells of one delivery that required just such make-do. He was attending a woman in premature labor whose baby was breech. With one hand on the baby's foot and the other cradling a phone, he consulted an obstetrician at the University of New Mexico. The patient was too unstable to travel, so they flew the obstetrician in to do a cesarean delivery. "We dusted off an unused operating room, and the hospital administrator, who used to be a scrub nurse, pitched in. Together, we performed a successful delivery."

Generations ago, many American Indian women delivered at home with a midwife or traditional healer in attendance. Home delivery is now an exception, says Roubideaux. Midwives are still integral to hospital births, however. The Service has transitioned to team-oriented care, including midwives along with family physicians, who serve as team leaders.

Statistics point to the Indian Health Service's success. The infant mortality rate among American Indians and Alaska Natives is nearly level with that of all U.S. populations, and the maternal mortality rate among American Indians and Alaska Natives has dropped significantly since the Indian Health Service was founded in 1955.

"Per capita, the IHS budget is only about half that of the federal employee health benefits system so we have to be efficient and economical," says Cobb. "But if we weren't there, no one would be. The private sectors won't go out to these remote locations and build clinics."

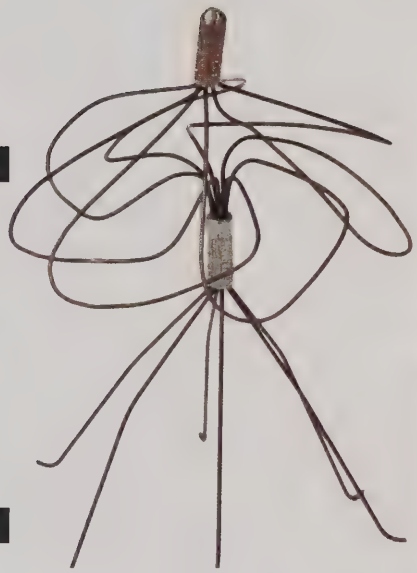
Challenges remain in bringing modern obstetric care to every woman in the United States. But whether it's at the Zuni Indian Hospital or the California Pacific Medical Center, the joy of being present at the birth of a child remains.

"I get about 200 Christmas cards every year with photos of babies," says Green. "The high-touch part of the job makes it worth the sleepless nights." ■

Ellen Barlow is a freelance science writer based in Massachusetts.

PHOENIX INDIAN MEDICAL CENTER, INDIAN HEALTH SERVICE

HEART LAND

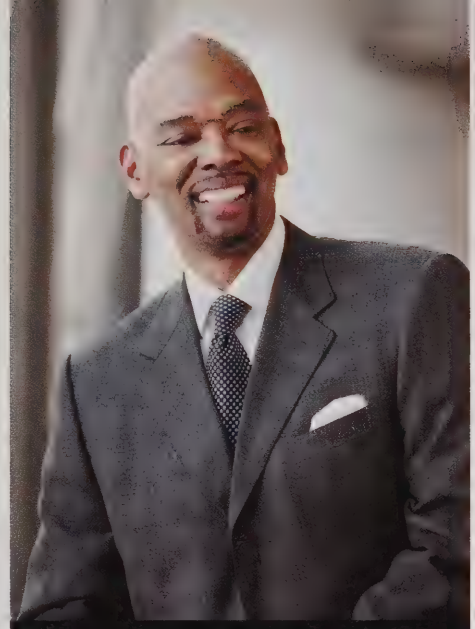


The pace of progress against cardiovascular disease has been swift, but it has left some behind

by Elizabeth Cooney

PAUL MORRISON

It was 1961 and John F. Kennedy was settling into the White House when the Framingham Heart Study first used the phrase "risk factor" to describe now-familiar predictors of cardiovascular disease: high blood pressure, high cholesterol, diabetes, a sedentary lifestyle, family history, and smoking. ■ From a state of relative ignorance and conjecture about what was causing the country's epidemic of heart disease, a fundamental understanding would emerge of what continues to place more people on the path to disability and death than any other illness. ■ Overall, the news is good: It's even better if you are white, well educated, well off, and male. Across the nation, there are peaks and valleys in the landscape of heart health. Improvements in disease prevalence and mortality accrue for some and erode for others, while a fuller understanding of the biological and social determinants of disease —who gets sick and who dies—remains uncharted. »



THE HEARTBEAT OF AMERICA: Investigating the symptoms, risks, prevention, and treatment of cardiovascular disease throughout the nation's diverse population has been the long-term research focus of HMS alumni (from left) Herman Taylor, Paula Johnson, Christopher O'Donnell, and C. Noel Bairey Merz.

Made to Measure

The year of the Framingham Heart Study's report also witnessed the nation's first coronary care units; close monitoring of patients who had suffered acute myocardial infarction cut hospital deaths from heart attacks in half. Three years later, a report from the U.S. Surgeon General strongly linked smoking to lung cancer and coronary heart disease, beginning what would become a steep decline in tobacco use.

These turning points signaled a new era of recognition, prevention, and, ultimately, treatment of heart disease and stroke that has transformed cardiovascular medicine to a degree only imagined in that early report from the Framingham study researchers. From 1968 to 2008, the death rate from heart disease dropped nearly 68 percent, while mortality from all other causes declined by a comparatively slight 6 percent.

Other statistics are not so encouraging. Hypertension rates among African Americans, already the highest in the world, are rising. So are the costs: In the United States, deaths related to high blood pressure in African American men are nearly three times higher than those among white men.

Where in the nation you live matters, too. Minnesotans are the least likely to die of cardiovascular disease, while people in Mississippi anchor the opposite end of the mortality curve by an almost two-to-one margin. Risk factors cluster with mortality. People in Colorado are less sedentary than their counterparts in Louisiana—and less likely to die of heart disease. Utah has the lowest proportion of people with high blood pressure, while Alabama has the greatest share of people living with this strong predictor of heart attack.

Risk Analysis

Just as two Harvard professors helped assemble the landmark surgeon general's report on smoking in 1964, today's HMS-trained clinicians and scientists are gathering data and using new tools, such as genome sequencing, to probe how and why our number-one killer strikes women and men, black and white, poor and rich so unequally.

Herman Taylor '80 is one of these investigators. Since 1998 he has directed the Jackson Heart Study, which is both a direct descendant of and a departure from the Framingham study.

"We are in the midst of a fairly dramatic drop-off in deaths, but not everyone is benefiting equally from the advances in cardiovascular care and prevention," says Taylor, a professor of medicine and Shirley Professor for the Study of Health Disparities at the University of Mississippi Medical Center. "If you look at the African American population within the American population, you see quite different patterns. We've got an epidemic that's essentially unchecked. Here in Mississippi, we are focusing on the epicenter of the epidemic of cardiovascular disease that has persisted into the twenty-first century."

The Jackson Heart Study has enrolled more than 5,300 participants from all walks of life and has gathered clinical and genetic information from individuals as well as families. The socioeconomic diversity of this study's population is itself a contrast to that of most populations assembled in early health disparities research, which concentrated disproportionately on the African American poor. Both poor and having poor access to health care, they experienced the worst outcomes, skewing research results toward the negative. Taylor likens it to looking at Appalachia for a view of health in white Americans.

One early result of the more heterogeneous Jackson Heart Study appeared positive: Study participants over age 60 had their high blood pressure under control at levels comparable to those in white people. But there also was bad news: 80 percent of African Americans over age 60 had high blood pressure that needed to be treated, compared to 60 percent of all Americans over that age.

"When you have numbers like that, you're compelled to look further upstream," Taylor says. "The temptation is to say African Americans have more heart disease because they have higher levels of risk factors. That's not an answer. Instead we should ask: Why do they have so many risk factors? and Why are those risk factors more prevalent? Such findings also underscore the urgent need to focus on prevention. Improving our control of blood pressure in patients is critically important and should not be minimized, but it's far better to keep people from becoming heart patients in the first place."

Sister Act

African Americans aren't the only Americans who have historically been underrepresented in research studies. Women, too, have been excluded, or included in numbers too small to generate meaningful findings. These omissions began to be amended after a 1993 federal mandate required that ethnic and racial minorities and women be included in research studies.

When she was head of the National Institutes of Health, Bernadine Healy '69 launched the Women's Health Initiative. One of its goals was to more rigorously test assumptions of benefit in women, such as an association between hormone therapy and prevention of heart disease. In 2002, one of the Initiative's studies of this association was famously halted when hormone use was linked to an increased risk of breast cancer with no improvement in heart disease risk.

JOHN SOARES (LEFT); BRIGHAM AND WOMEN'S HOSPITAL

JOHN SOARES; CEDARS-SINAI MEDICAL CENTER (RIGHT)

C. Noel Bairey Merz '81 is also cut from the cloth of inclusion, dedicated to changing the model of most studies being done "in men, for men, and by men." Bairey Merz, professor of medicine at Cedars-Sinai Medical Center and director of the Barbra Streisand Women's Heart Center at Cedars-Sinai Heart Institute, leads the Women's Ischemia Syndrome Evaluation (WISE), now in its seventeenth year. WISE is designed to explore differences in heart disease suffered by women.

Before Bairey Merz's work, a woman could suffer chest pain, produce abnormal scores on a stress test, or even have a heart attack, but if the gold standard for diagnosing heart disease—the coronary angiogram—revealed no blockages in her coronary arteries, the diagnosis was "cardiac syndrome X."

The WISE project revealed why coronary angiograms, in which a dye is injected into arteries and tracked by X-ray imaging, were not recognizing heart disease in women. The tests are good at revealing chunks of fatty plaque lining blood vessels leading to the heart—the male pattern of ischemic heart disease. They aren't as good, however, at showing what is now considered a female pattern of plaque deposition: diffuse deposits that narrow the blood vessels in a different but no less deadly fashion. The WISE trial showed that nearly a third of women with obstructive heart disease had this distinct pattern of plaque deposition in their arteries.

"For the past 50 years," says Bairey Merz, "we've gotten pretty good at treating the male-pattern plaque problem, but we do not yet have comparable strategies for seeing diffused plaque."

Paula Johnson '84 has called the right to health care and a healthy life the "unfinished work" of the civil rights movement. For all people to reach that goal, we need a better understanding of why some groups have higher rates of risk factors and poorer outcomes for all diseases, including heart disease.

"We cannot assume that what is an effective prevention strategy in terms of men is going to be exactly the same for women," says Johnson, an HMS associate professor of medicine at Brigham and Women's Hospital, where she is also executive director of the Connors Center for Women's Health and Gender Biology. "It's critically important to look at women and to look at racial and ethnic differences, but you must also look at the intersection of those two together."

Something to Talk About

The complex biological picture of heart disease may be shaped decades before diagnosis in an environment of stress dating back to childhood, perhaps even before birth. Disorders of pregnancy, such as preeclampsia and gestational diabetes, may relate to children's heart health, according to Johnson. The lifelong corrosive effects of discrimination, which have been linked to hypertension in the Jackson Heart Study, may worsen the risk for the disease. Among African Americans, coronary heart disease develops earlier, and its course is more severe.

Bairey Merz is cautiously optimistic about progress since 1984, when more women than men died of heart disease. In 2006, the number of women who died of heart disease started to decline; however, female mortality remains higher than that for males.

"At last the problem is out there and people are talking about it," she says. "We're all working hard to close the gap and to understand why there are disparities. It's more than gender. It's ethnic disparity, racial disparity, and economic disparity. A battle may have been won, but the war is still on."

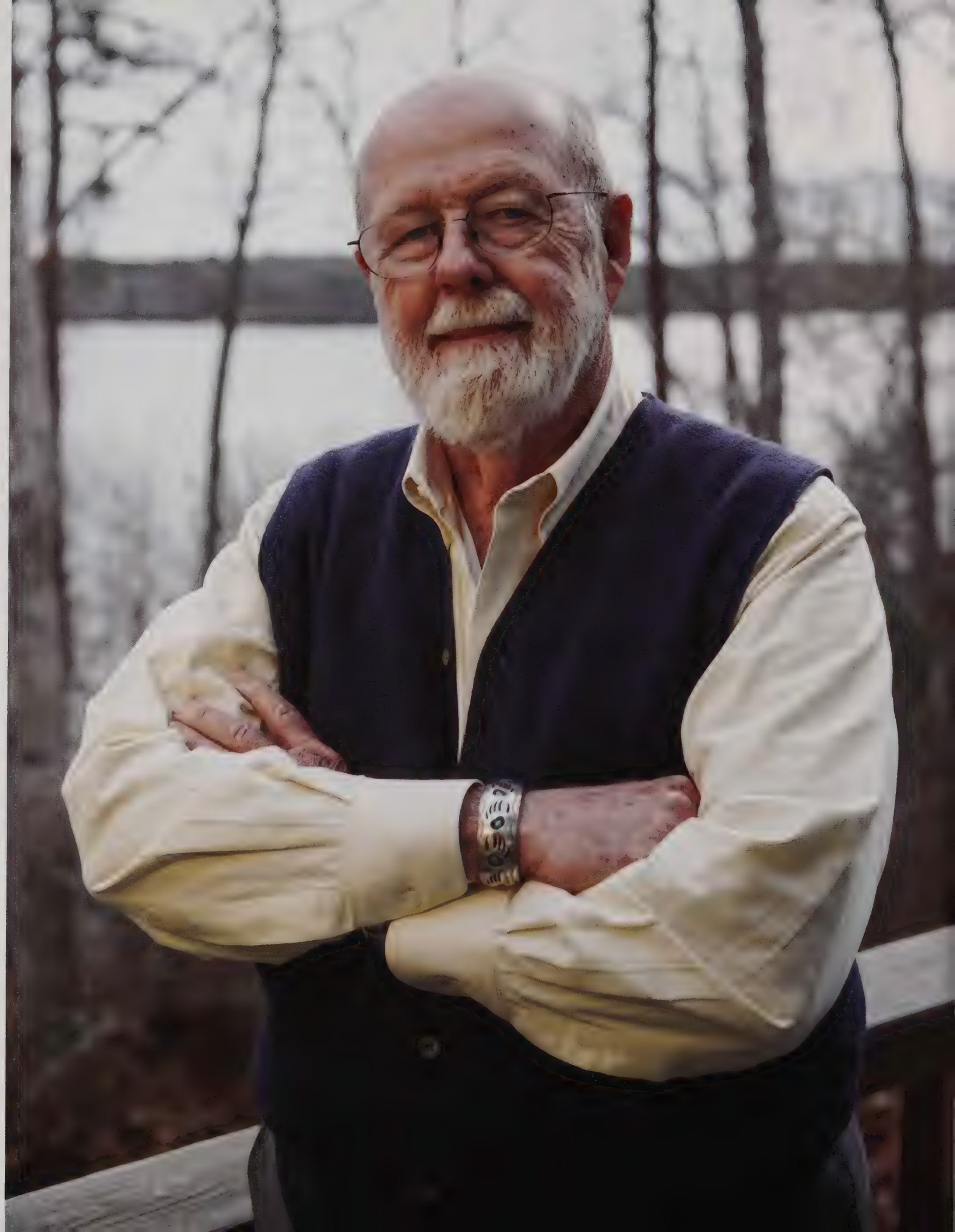
Critical Mass

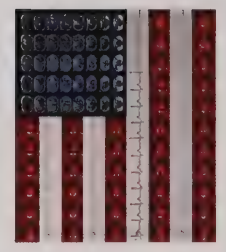
The original Framingham researchers knew heart disease ran in families. Today's scientists, in Framingham and Jackson, use advanced genomic tools to understand with great precision what might influence that family history. When Elizabeth Nabel, president of Brigham and Women's Hospital, was director of the National Heart, Lung, and Blood Institute (NHLBI), she made it her mission to support genetic studies of coronary disease. In 2005, the Framingham Heart Study, which now includes three generations of families, began to sequence the genomes of its participants in order to pinpoint genetic alterations that might lead to disease.

To make these discoveries, however, researchers need more numbers than Framingham's generations can provide. Its 9,000 samples have been analyzed together with data from 60 different cohorts and more than 70,000 patient samples of the international consortium Cohorts for Heart and Aging Research in Genomic Epidemiology. This mass of data allows scientists to detect genomic variants that may have been missed in the first wave of genetic studies.

"There have been improvements in mortality from heart attack and stroke for men and women in the United States," says Christopher O'Donnell '87, an HMS associate clinical professor of medicine at Massachusetts General Hospital, senior investigator at NHLBI, and associate director of NHLBI's Framingham Heart Study, "but there remains a huge opportunity to lower the risk even further. By understanding the heritability—the genetic components—of risk factors and heart disease itself, we might be able to bend the curve even further to completely prevent heart disease." ■

Elizabeth Cooney is a science writer in the HMS Office of Communications and External Relations.





For family medicine practitioners, it's the relationships that make the difference

by Jessica Cerretani

FAMILY MATTERS

John Tudor

Family and Preventive Medicine faculty, retired, University of Utah

WHEN JOHN TUDOR GRADUATED from HMS in 1964, family medicine wasn't even a recognized specialty. That, however, didn't stop him from pursuing his dream of becoming "a small-town country doctor." While at HMS, Tudor took part in a three-year elective program at what is now Boston Children's Hospital. "Each student was assigned to take care of one family during that time," he explains. "We saw all family members for well visits, made house calls, and were present when babies were born." Yet the experience was simply called general practice. That changed in the late 1960s, when the field of family medicine was established.

A handful of years ago, says Tudor, "general practice and family medicine were looked at as being what you did if you couldn't do better. Today, it's the single largest specialty in the United States, with nearly seventy thousand members in the American Academy of Family Physicians." What's changed? Tudor credits in part a greater demand for generalists, which in turn has led to more respect, better networking opportunities, and more competitive salaries—a deciding factor for many debt-saddled physicians.

At the same time, Tudor—who also served as a division head in family medicine at the University of Arkansas before retiring in 1996—believes there's still much work to be done, particularly in medical education. In fact, during his 1992-93 term as AAFP president, Tudor visited the deans of Massachusetts-based medical schools and urged them to start family practice residencies in their hospital groups.

"The key to this field is that you follow patients for years," he says. "Most medical schools don't teach that way. I'd like to see HMS and other medical schools allow students to experience continuity of care, so they have the opportunity to build relationships with patients and practice follow-up over time. That's what family medicine is all about."

CHRISTOPHER HARTING

Stephen Martin

Assistant Professor of Family Medicine and Community Health and codirector, Rural Health Scholars Program, University of Massachusetts Medical School; family physician, Barre Family Health Center, Barre, Massachusetts

FAMILY, MEDICINE, and family medicine are deeply intertwined for Stephen Martin '01. Both his wife and brother are family medicine physicians. This focus on family was augmented for Martin by six years in K-12 education and four years in the National Health Service Corps, each underscoring for him the need for multidimensional care for children and adults.

"The specialty lends itself to long-term healing relationships," he says. "Your time with patients helps you consider all the variables that influence their health." As an example, Martin points to a 48-year-old patient he cares for at the rural Barre Family Health Center in Massachusetts. "She has stage IV small intestinal cancer. From the time she was diagnosed on our inpatient service, we discussed everything from palliative care to her family relationships," he explains. "I need to pay as much attention to my patient's relationship with her daughter as I do to her pain control."

Such an approach may be the wave of the future. Martin cites the increasing decentralization of health care—from specialized treatment to patient-centered care that takes place outside the hospital—as a perfect opportunity for family medicine physicians.

But obstacles remain. "The way we finance medical care is still procedure-based," he says. "We help patients by phone day and night. We provide and coordinate care for patients with multiple serious illnesses. And we assist with food and transportation. There's no reimbursement for these 'non-procedures.' We need to realize that financial considerations like these will affect doctors' career choices—and health care in general."

Despite such concerns, Martin remains optimistic. "When we put patients first, the value of family medicine becomes even more obvious."

JOHN SOARES

Kathleen Barnes

Master of Public Health, Harvard School of Public Health; 2012 Pisacano Scholar, American Board of Family Medicine

KATHLEEN BARNES '13 sums up her attraction to family medicine in one word: relationships. Several years of volunteer work at free clinics and organizations both in the United States and abroad fostered her interest in exploring the aspects of people's lives that contribute to illness—and to health. "This work sparked my love of getting to know people and forming meaningful relationships with them over time," she says.

Back at HMS, though, Barnes found that the power that relationships can bring to the delivery of health care isn't always conveyed to medical students. While a year in the School's Cambridge Integrated Clerkship gave her an opportunity to take part in delivering the full scope of care to a single patient, that experience—one that's limited to 12 students—is the exception, not the rule. Instead, most students engage in block rotations, which, while valuable, can't provide the longitudinal patient experiences that define primary care. "It's a blessing that we're able to receive training at major medical centers because we can see illness at its most acute stages," she says. "The problem is that we don't have much long-term exposure to individual patients. When we can feel ourselves in the role of primary caregiver, there's a sense of real learning that happens."

Barnes hopes more students will rethink the way they view the practice of family medicine. "There's a lingering attitude that we're somehow letting Harvard down if we don't go into lucrative specialties. I want students to know that generalist skills can be just as highly valued."

Jessica Cerretani is a health and medical writer based in Boston.

Kenneth Bollin

Chief of Family Medicine, St. John Hospital and Medical Center, Detroit, Michigan

KENNETH BOLLIN '76 chose a career in family medicine not because he didn't enjoy the various specialties, but because he liked them all. As a student, each new rotation—from internal medicine, to obstetrics and gynecology, to pediatrics—struck his fancy. "I realized," he says, "that I not only loved interacting with patients of all ages and walks of life, but that I wanted to build relationships with them over time. Family medicine physicians are the consummate providers of this type of continuous care."

A National Health Service Corps scholarship took Bollin to Algonac, a small town in Michigan. There he found he loved the life of a community doctor; a two-year commitment turned into a decade of service.

Seeking to share his dedication to family medicine with others, Bollin eventually moved to St. John Hospital and Medical Center in Detroit, where he teaches medical students to meet the special challenges of the field, from cultivating exceptional communication skills to appreciating the time commitment necessary to providing continuity of care.

"I've taken care of multiple generations. Some of my patients have been with me for more than thirty years," he says. "When that is the case, you're not just a doctor, you're almost a part of the family."

He's also passionate about educating students about the financial realities of family medicine. "We need to compensate family practitioners better, but the truth is that it's entirely possible to make a very good living in this field if you're patient," he says. "I want new family doctors to understand that, to be proud of what they do, and to know the emotional rewards are great." ■

SCOTT STEWART

Research is sounding the depths of the connections between

Beyond Belief

spiritual practice and biomedicine

by David Cameron

Not long ago, David Rosmarin found himself in an awkward situation. Rosmarin, an Orthodox Jew, wears a yarmulke, and this outward statement of faith rendered him a kind of magnet for McLean Hospital's more spiritually inquisitive residents. Yet, as a new instructor in psychology in the hospital's Department of Psychiatry, he didn't want to overstep his boundaries when patients—not his own—tried to engage him in conversations regarding spiritual issues. So for his first six months at the hospital, he offered only a brief palliative: "I'm sorry, but you'll need to speak with your case manager. I'm not on your team." ■ Rather than continue to skirt the matter, Rosmarin and a few colleagues developed a spirituality and cognitive behavior therapy group at one of McLean's day programs. Patients raved about it, many claiming on their exit interviews that it was the best part of their outpatient treatment.

MATTIAS PALUDI

The success of the group led Rosmarin to think critically about his years of psychiatric training. He realized that the concept of querying a patient about his or her religious beliefs fell into an educational blind spot.

Article of Faith

The field of psychology, Rosmarin's chosen field, is a rather secular enterprise. A 2007 study in *Professional Psychology: Research and Practice* found that psychologists are five times more likely to be atheists than non-psychologists. For that reason alone it's hardly surprising that the number of studies examining the relationship between spirituality and mental health is, to say the least, scant.

"I realized it was time to start getting some science behind this," Rosmarin says.

One concept he had been pondering was whether a person's religious beliefs might affect treatment outcomes. He decided to find out. With funding from the Gertrude B. Nielsen Charitable Trust, he recruited 159 patients and assessed their belief in God using a five-point scale that ranged from no belief at all to strong faith in God. He also evaluated the patients' psychological status over a brief course of treatment, measuring such variables as depression, well-being, and intent to self-harm.

The findings surprised Rosmarin. Not only was a belief in God strongly correlated with positive treatment outcomes—the stronger the belief, the better the recovery—but the intensity of the belief in God also paralleled the degree of hope placed in therapeutic interventions. Stated another way, the findings, reported in the October 2012 online issue of the *Journal of Affective Disorders*, showed that nearly all the atheists in the study felt their treatments would fail.

Pressure Points

Although the connection between patients' personal beliefs and their physical health remains peripheral to most medical training, many notable figures in the School's history have taken the subject seriously. Oliver Wendell Holmes, Class of 1836 and HMS dean from 1847 to 1853, emphasized how compassion within the doctor–patient relationship expedited healing. William James, Class of 1869 and author of *The Varieties of Religious Experience*, supported the "mind-cure movement," which allowed for thinking yourself to better health, and famously argued that emotions are the result of physiological conditions. And Walter Bradford Cannon, Class of 1900 and the researcher who characterized the "fight-or-flight" response, studied the relationship between emotions and the nervous system.

Cannon, in particular, is close to the heart of Herbert Benson '61, an HMS professor of medicine and the founder of what is now the Benson–Henry Institute for Mind Body Medicine at Massachusetts General Hospital. It was in the same laboratory space at HMS where Cannon conducted his research nearly a century ago that Benson identified fight or flight's antipode: the relaxation response.

During the 1960s, Benson was toying with a theory that grated on the sensibilities of his fellow cardiologists, namely, that emotional states could affect blood pressure. At the time, high blood-pressure levels were widely considered to be the exclusive byproduct of kidney disease.

"The very idea that there could be a mental component to high blood pressure was heretical," Benson recalls.

To test his theory, Benson and his colleagues taught primates to regulate their blood pressure in response to environmental stimuli. The findings, published in 1969 in the *American Journal of Physiology*, caused a blizzard of media attention. Students who practiced transcendental meditation claimed that they could achieve the same result, and they wanted Benson to demonstrate their claim. After much reluctance and deliberation, he agreed.

Benson enrolled volunteers who practiced transcendental meditation and monitored their brain activity, breathing, blood pressure, and metabolism during meditation. He found that the meditative state decreased metabolism, blood pressure, and breathing rates, and altered brain waves.

"This was the diametrical opposite of the fight-or-flight response," he says. It was the phenomenon he ultimately called the relaxation response.

Om Schooling

Benson has spent the past four decades of his career studying, and promoting, the health effects of different meditative techniques that elicit this response. Such techniques, he says, can successfully treat a variety of health conditions, particularly those exacerbated by stress, which account for the lion's share of doctor visits. In fact, a 2008 study in *PLoS ONE*, reported by Benson, Towia Libermann, an HMS associate professor of medicine and director of the Genomics Center at Beth Israel Deaconess Medical Center, and colleagues found that the relaxation response can positively affect the expression of genes related to immunology, inflammation, and aging. This was, according to the researchers, the first comprehensive study to show a connection between meditation and gene expression.

Despite the veneer of Eastern spirituality often associated with meditation, there is nothing especially religious about Benson's approach. Patients are taught to sit comfortably, ease their muscles, and draw attention to their breathing by synching it to a word or short phrase that they repeat throughout the session. Sometimes they're encouraged to visualize a soothing image or memory. In one sense, this looks like something you might learn in anger management 101.

Patients who identify with a particular religion, however, are offered the choice of using a word or short phrase that is spiritually significant to their beliefs: Catholics might say, "Hail Mary, full of grace," Jews could recite, "Sh'ma Yisrael," and Muslims might repeat, "Insha'Allah."

"By having people repeat something they believe in, we help ensure compliance with the relaxation response while also building in the placebo effect," he says. "Belief is essential."

Sweet Nothings

"Placebo" is a loaded term, one that implies deception or the power of positive thinking. Latin for "I shall please," it implies false flattery. In clinical trials a placebo sets the bar for determining a "real" drug's efficacy. If a drug fails to perform better than a placebo, it's deemed useless, no more effective than the boost gained from a good attitude.

Not only was a belief in God strongly correlated with positive treatment outcomes, but the intensity of the belief in God also paralleled the degree of hope placed in therapeutic interventions.

Ted Kaptchuk, an HMS associate professor of medicine at Beth Israel Deaconess Medical Center, has long been carefully studying the placebo effect. As a result, he has developed surprisingly nuanced views on what is meant by the mind–body connection.

"Personal beliefs, whether they're religious or not, give solace during sickness. But does that translate into improved clinical outcomes, improved symptomatology? I think the evidence is just not there," he says. For someone like Kaptchuk, a researcher who time and again has demonstrated the powerful effects placebos can have on those who take them, such a statement might seem incongruous.

But for Kaptchuk, equating placebo with belief is far too simplistic. A small 2010 study of his showed that placebos work even when patients are told that the pill they are taking contains no active compound. In the common understanding of the placebo effect, such results simply don't make sense.

"We don't understand the placebo effect because we are wedded to our current cognitive frameworks," he says. "I feel there are latent variables that we don't measure. Like the way a physician looks a patient in the eyes, the way he leans forward, the tone of his voice, the sights and smells of the examination room." In other words, the exam's ritual. Supporting this view, Kaptchuk's team recently published in *Proceedings of the National Academy of Sciences* a study demonstrating that the environmental cues of positive placebo benefit can be activated nonconsciously, totally outside the awareness of the patient.

In 2011, Kaptchuk published a review article in *Philosophical Transactions B* titled "Placebo studies and ritual theory: A comparative analysis of Navajo, acupuncture and biomedical healing." In it he argues that the placebo effect is the culmination of the healing ritual—the offer, acceptance, and ingestion of a pill, even an inactive one. Participation in the medical and healing process probably influences the activity of neurotransmitters such as dopamine and serotonin.

This line of thought might help explain the perplexing results of a 2006 study in which Benson and colleagues observed the effects that intercessory prayers said by strangers had on cardiac bypass patients. The patients were divided into three groups: one whose members were not prayed for but did not know it; one whose members were prayed for but did not know it; and one whose members knew they were being prayed for. Participants in the first and second groups fared no differently during the recovery process. But the third group, those who knew they were being prayed for, had a higher incidence of complications.

Although the researchers noted that there are many variables that may account for this perplexing finding, it may be worth noting that the third group of patients received prayers minus the ritual—they had knowledge of intercessory prayer, but none of its context.

A Still Small Voice

William James saw religious experience as the closest thing we have to a microscope into the mind, and Rosmarin is clearly continuing this line of thought. The findings from his *Journal of Affective Disorders* study have inspired him to delve more deeply into the relationship between religious belief and mental health. He's now investigating the effect of belief among geriatric patients and patients with bipolar disorder. Rosmarin is also looking into the potentially negative consequences that certain spiritual beliefs can have for patients with psychoses.

"There are so many questions we need to answer concerning belief and psychiatry," Rosmarin says. "Basic questions, basic information that we just don't have." ■

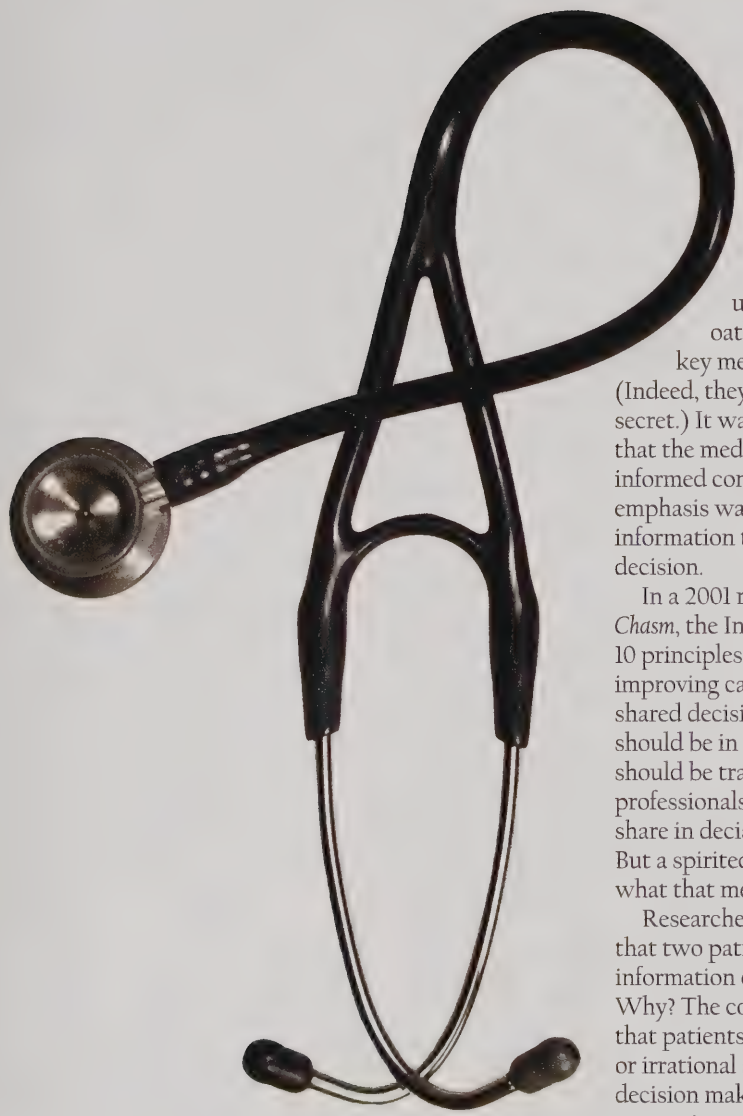
David Cameron is director of science communications in the HMS Office of Communications and External Relations.


MULTIPLE

Shared decision making requires doctors and patients to acknowledge personal values—and idiosyncrasies **by R. Alan Leo**

CHOICE

The pain was sudden, intense. ■ Young and athletic, a distance runner, Jerome Groopman had no history of back pain. Yet one simple movement, standing upright from a seated position, had elicited a shooting pain. The doctors he consulted throughout the following weeks could find no cause. ■ Undeterred, he sought aggressive, decisive intervention. In his own father's early death from a heart attack, Groopman had witnessed missed opportunities. At Massachusetts General Hospital and the University of California, Los Angeles, he had trained under enthusiastic interventionists, and in his career he had seen novel therapies work wonders for his patients. So when it was his turn as a patient, Groopman chose the most aggressive treatment available: a spinal fusion. ■ "It was a disaster," says Groopman, who is today the Dina and Raphael Recanati Professor of Medicine at HMS and Beth Israel Deaconess Medical Center. The pain worsened. He lost mobility. But the experience planted a seed that led him, decades later, to join a debate that's changing how patients and doctors make medical decisions.



Every Which Way

Shared decision making is itself a recent and revolutionary change in medicine. For more than two millennia, physicians understood their Hippocratic oath as license and duty to make key medical decisions for patients. (Indeed, they swore to keep their methods secret.) It was only in the twentieth century that the medical profession embraced informed consent, and even then, the emphasis was only on giving patients the information they needed to make the right decision.

In a 2001 report, *Crossing the Quality Chasm*, the Institute of Medicine proposed 10 principles for redesigning and improving care. Half of them involved shared decision making, from "the patient should be in control" to "the system should be transparent." Twelve years later, professionals agree that patients should share in decisions about their medical care. But a spirited debate has followed about what that means, and how to get there.

Researchers, for instance, have noted that two patients presented with the same information often make different choices. Why? The conventional answer has been that patients are either underinformed or irrational and that any effort to share decision making should be approached first as a patient-education exercise. But recent studies suggest that the more a group of patients learns about the risks and benefits of various treatments, the more their decisions vary from one another's.

One patient may opt for the certainty of an invasive test while another prefers less intervention. Their choices are shaped by emotions, relationships, and values.

Groopman's experience suggests that patients aren't irrational per se—rather, different personal values lead to different choices. One patient may opt for the certainty of an invasive test while another prefers less intervention. Their choices are shaped by emotions, relationships, and values. Identifying the values, and incorporating them in care decisions, has become a fundamental tenet of shared decision making. Still, experts say, presenting the facts and asking the patient "now what?" isn't enough.

Adding Value

"It isn't so simple, to just ask someone for his or her values," says John Livingstone '58. Livingstone, an HMS assistant clinical professor of psychiatry at McLean Hospital and founding director of the hospital's Outpatient Service for Children, trains health coaches and health care providers how to effectively communicate with patients, with a focus on health-related behavior change and shared decision making. Increasingly, health care networks, insurers, and other institutions are turning to the tools of psychology—and to experts like Livingstone—for guidance on such communication.

New doctors receive training in how to talk to patients, and research points to the efficacy of a growing number of decision aids for patients: educational booklets, videos, and guiding questions designed to facilitate shared decision making. In 2011, a review of 86 studies found that patients who used decision aids had increased knowledge about their choices, more accurate risk perceptions, reduced internal conflict, and a greater chance of receiving the type of care that aligned with their values.

Advocates have urged the federal government to promote patient decision aids through a provision of the Affordable Care Act intended to encourage shared decision making. In January, bioethicist Ezekiel Emanuel '85 made the case in an article in the *New England Journal of Medicine*.

"We believe that the Centers for Medicare and Medicaid Services should begin certifying and implementing patient decision aids," he wrote with co-author Emily Oshima Lee, "aiming to achieve three important goals: promote an ideal approach to clinician–patient decision making, improve the quality of medical decisions, and reduce costs."

Patients, like doctors, may be aware of only certain aspects of their own selves. And an unvoiced concern, conscious or not, may sow regret or thwart a patient's attempts to change behavior.

Emanuel argued that Medicare and Medicaid should act quickly to require the use of decision aids for the 20 most frequently performed procedures, which include breast biopsy, prostatectomy, and surgery for low back pain. Indeed, such a tool may have helped Groopman reach a different decision years ago: One in five patients who participate in shared decision making chooses more conservative treatment than those who are not involved in the care decision, the 2011 review found.

But patient decision aids face competing headwinds. On one side are physicians who say that demands for their time already exceed the hours in a day. On the other are those like Livingstone and Groopman, who caution against reducing the patient–physician encounter to a checklist. "The patient's truths are held by the patient, and aren't often reflected in the questionnaire, in a checklist," Livingstone says. "Human beings live and thrive on relational connection. It takes time to connect."

"Even if you're going to use a list of questions to guide an interview," he adds, "don't let it cover over your connection with the patient's values, emotions, and beliefs—or your own."

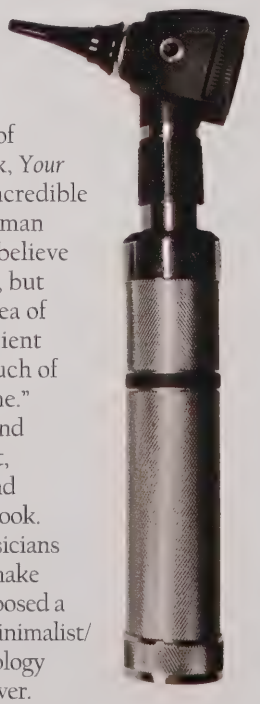
Livingstone thinks patient decision aids have a critical role to play in patient-centered care. But he cautions that the more widely used decision aids—such as the Ottawa Decision Support Framework—are dominated by approaches that may ignore a patient's emotional states and needs. That mismatch, Livingstone says, reflects the ascendancy within psychiatry of cognitive methods, which emphasize patterns of thought and scripted conversations, and, perhaps, appeal to physicians' natural affinity for its rational approach.

The problem, Livingstone says, is that patients, like doctors, may be aware of only certain aspects of their own selves. And an unvoiced concern, conscious or not, may sow regret or thwart a patient's attempts to change behavior.

The good news, he says, is that new methods that also encompass emotions and relationships are producing the kinds of evidence-based solutions that health care providers demand, and that the nation's Affordable Care Act mandates. "We're on the cusp of change here," Livingstone says. "We have an opportunity to do something that's helpful to the entire field."

Split Decision

Groopman and Pamela Hartzband '78, an HMS assistant professor of medicine at Beth Israel Deaconess, warn against spreading a "factory model" of health care in their 2011 book, *Your Medical Mind*. "There is this incredible drive to standardize," Groopman says. Adds Hartzband, "We believe in standardization for safety, but once you move out of that area of standardization and into patient and physician preference, much of medicine becomes a gray zone."



Groopman, an oncologist, and Hartzband, an endocrinologist, plunged into that gray zone and detailed their findings in the book. After asking patients and physicians across the country how they make decisions, the researchers proposed a new model with three axes: minimalist/maximalist, naturalism/technology orientation, and doubter/believer.

When doctors recognize their own mindsets, the researchers say, they are better able to understand those of their patients, an insight that can be valuable to the process of shared decision making. It also helps physicians decipher their own decision-making patterns, and recognize how they align with and vary from each patient's pattern.

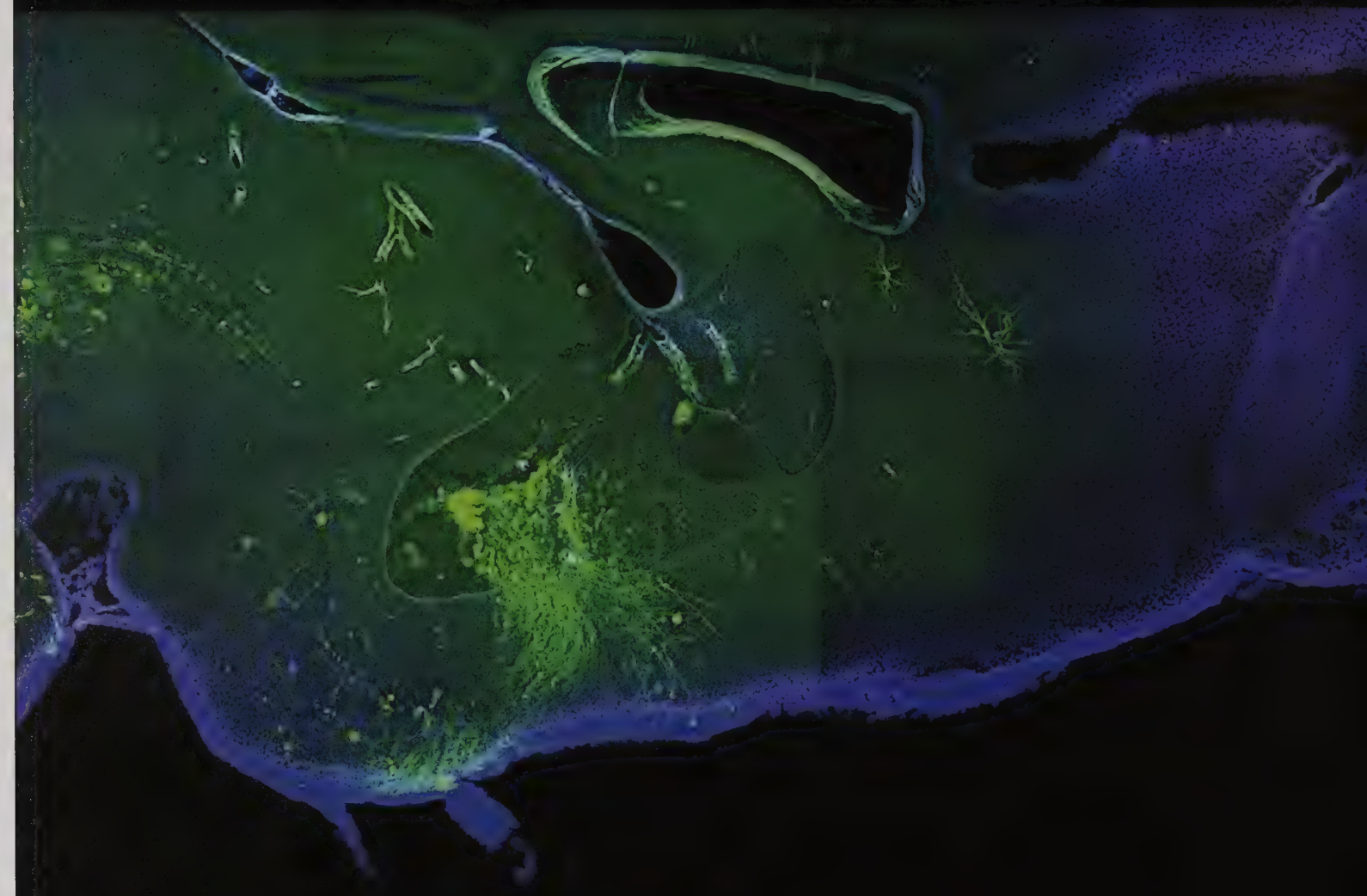
What's more, adds Livingstone, gaining this personal understanding frees doctors to focus on their patients' needs. "You know on the airplane, the flight attendant tells you to put the oxygen mask on yourself first."

"The medical community," says Hartzband, "has been incredibly receptive to hearing about this dimension of care, which hasn't been addressed in a substantial way." Since publishing *Your Medical Mind*, the authors have spoken with practitioners around the country. The most rewarding question they encounter, Hartzband says, is: Why hasn't anyone told us this before?

In hindsight, Groopman recognizes his approach as maximalist (choosing immediately the most aggressive intervention); technology orientation (seeking the newest approach); and believer (believing that medical science holds the answer to the problem). A minimalist might have waited to see whether his back improved on its own; a person with a naturalism orientation might have relied first on exercise; a doubter might have focused on the risks of surgery and the uncertainty of the prognosis.

Hartzband describes herself as a minimalist and doubter. As a thyroid specialist, she sees patients who need to make decisions about thyroid surgery despite having had repeated biopsies that did not yield enough cells to exclude a diagnosis of cancer. Many ask the question posed, eventually, to every physician: "What would you do, in my shoes?" Her answer: "It depends." She explains that people have different ways of weighing risk and benefit. "If it was me, I'd watch and wait," she tells them. "But my husband would have had the surgery yesterday."

"I'm not as maximalist as I used to be," says her husband—and co-author—Groopman. ■



Going Viral

GLOWING IN THE DARKNESS like an island seen from on high, a slice of the brain of a mouse shows blue neurons hugging its coastline and green neurons traversing the interior. This is a sliver of the cerebellum, the part of the brain where motor control resides. It is an image with quiet beauty, but it is also an image that tells a story about the connections neurons make—a story that may have surprising implications for human health.

Scientists in the Department of Neurobiology at HMS are mapping the landscape between neurons to gain a deeper understanding of brain function. They are tracking how neurons communicate with one another by following the trail of chemical or electrical signals these cells send across specialized structures called synapses.

New technologies in neuroimaging are making it easier to see neurons and neural paths. Some of the neurons in this mouse cerebellum, for example, were infected with a virus engineered to produce a green fluorescent protein. Once this virus entered the neuron, it replicated and traveled along the neuron and dendrites to the synapses, where it jumped to connecting neurons. Other neurons were stained with blue dye, allowing the researchers to see the brain's different structures, thus providing a sort of cellular topography against which to reference the movements of the fluorescing virus. The researchers then used a fluorescent microscope to find the traveling viruses and to observe the dispersal of green to pinpoint synaptic connections and see how information flows through the brain.

CLOSE SHAVE: Three sections of a mouse brain show the transit of green-hued virus as it travels along neurons and moves across synapses. At left, an enlargement of a region of the section at bottom right.

The investigators expected the synaptic connections infected with the engineered virus to be localized in the areas of the brain involved in motor control, but instead they found the virus had traveled to connections beyond the cerebellum. The virus had spread to parts of the brain associated with higher-level cognitive function.

The scientists next plan to train a different type of light on these extracerebellar connections through a technique called optogenetics. They will again infect the neurons with a virus, this one producing a protein called channelrhodopsin. This photoresponsive protein will allow the researchers to use light as a switch to control synaptic activity in live animals.

"We hope to see how we influence a mouse's behavior when we activate synaptic connections," says Skyler Jackman, a research fellow in the laboratory of Wade Regehr, an HMS professor of neurobiology.

What they learn could be far-reaching.

"This could help us gain insight into how cerebellar dysfunction in humans might lead to neuropsychiatric disorders," Jackman says.

—Elizabeth Cooney

MICHELLE OCANA/NEUROBIOLOGY IMAGING FACILITY, HMS NEUROBIOLOGY DEPARTMENT

BACKSTORY

FROM THE COLLECTIONS AT HARVARD MEDICAL SCHOOL

For millennia, mediating childbirth was the province of women. As the original obstetricians—from the Latin, *obstetrix*, "midwife"—women routinely assisted other women in giving birth at home. "Man-midwives," or *accoucheurs*, became fashionable in seventeenth-century France and, later, in England, particularly for difficult births. In England, the Chamberlen family gained fame for its secret method of successfully assisting obstructed births. That procedure, which remained closely guarded for nearly a century, involved a type of forceps invented by a member of that family in the early 1600s.

Later innovations included the use of chloroform as an anesthetic and the implementation of antiseptic and aseptic practices, essential for successful cesarean deliveries. Early cesarean deliveries often failed, however, because of poor surgical techniques or infection. Improved surgical procedures and more in-hospital births brought double-digit reductions in the maternal mortality rate, but it was the advent of antibiotics that drove the rate down more than 70 percent before the close of the 1940s. By this time midwifery, renamed obstetrics, was taught in medical schools, and the role of women as obstetricians was diminishing.

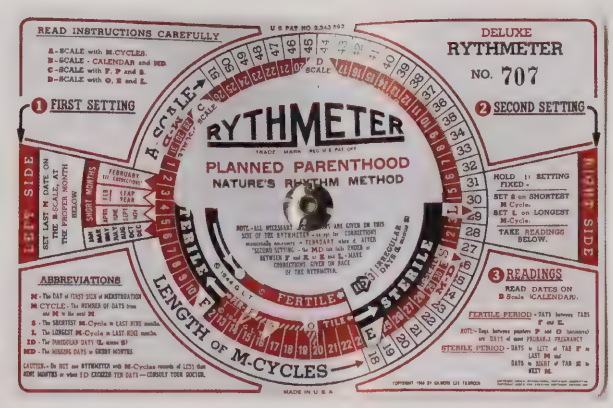
—*Susan Karcz*

PAUL MORRISON

PHOTO GALLERY

Medals from the collection of Horatio Robinson Storer
hms.harvard.edu/harvard-medicine

LABOR INTENSIVE: Objects include, clockwise, from left, an information booklet for a Norlestrin Petipac, circa 1975, from the collection of John Rock, Class of 1918; a plaster Dickinson-Belskie birth model, one in a series of reproductive anatomy educational tools created for the 1939 World's Fair; a Rythmeter, a calculator for the rhythm method of birth control, patented in 1947; and medals from the collection of Horatio Robinson Storer, Class of 1853, commemorating the pregnancy of Princess Elisabeth Christine of Bohemia in 1723 (left) and the birth of Princess Frederika of Prussia in 1770.



Medals courtesy of the Boston Medical Library in the Francis A. Countway Library of Medicine. Rythmeter courtesy of the Harvard Medical Library in the Countway Library. Petipac and birth cast courtesy of the Warren Anatomical Museum in the Countway Library.

FIVE QUESTIONS

FOR AMY WAGERS

Associate Professor of Stem Cell and Regenerative Biology, Joslin Diabetes Center, Harvard Medical School

Professor of Stem Cell and Regenerative Biology, Harvard University Department of Stem Cell and Regenerative Biology; Early Career Scientist, Howard Hughes Medical Institute.

What sparked your interest in stem cell research?
As an undergraduate, I registered to become a bone marrow donor, and almost became one a few years later, while in graduate school. That experience got me interested in learning about bone marrow transplants. After reading about stem cell biology, I decided that was the direction for me.

What are some misconceptions about the field?
Stem cells hold tremendous promise for improving human health, but they aren't the "magic bullet" for disease that some people consider them to be. Research and discovery are critical to realizing their full potential and appropriately applying them to human therapy. Such efforts take time, but even though progress can seem frustratingly slow, it's critically important that we get it right.

Have there have been moments in your work when you've had to take risks?
Someone once said, "leap and the net will appear," which I think describes the way of science. You have to come up with the best idea you can, but at some point, you just have to act. It's similar to skydiving—at some point, you've got to jump because you can't climb back down.

I understand you skydive and that you have taken trapeze lessons. What inspired those hobbies?
As a postdoc, I was working in the lab close to 24/7, either on projects or fellowship applications. One application asked what I did in my spare time. I realized I had very little spare time, and I wasn't doing much with the time I did have. So when a friend mentioned that the Circus School in San Francisco offered trapeze classes, I enrolled.

I began skydiving after my first paper as an independent faculty member was published in *Nature*. While it was under review, I said how amazing it would be if the journal published the initial paper out of my lab. If it did, I said, "I'll go skydiving!"

I loved it and decided that I would make it a tradition: skydive after a major paper is published.

How important is it to take time to celebrate?
I learned the importance of marking successes when I was in graduate school. My mentor started the tradition: For every paper we published, we celebrated with champagne. Then he would paste the paper's title and author on the empty bottle and put it on the shelf in his office. I now follow that same tradition with my students and postdocs. Keeping something from those celebrations reminds you that even when things get tough, there's a celebration at the end.

—Shraddha Chakradhar

PODCAST

The Methodical Adventurer: Stem cell researcher Amy Wagers enjoys the thrill of discovery
hms.harvard.edu/harvard-medicine

JOHN SOARES

President's Report

When it comes to alumni associations, size certainly matters. But for the Harvard Medical Alumni Association (HMAA), our true strength is found in the effects that our collective perspective can have not just on the School but on the future of science and medicine.

That's why your voice is so important. With so much happening at HMS—from the revisions to the preclerkship curriculum to the new team-science initiatives—your involvement in the HMAA has never been more valuable.

The Alumni Council is the connective tissue between the HMAA and the School. This group of elected volunteers serves as an advisory group to Dean Jeffrey S. Flier. For this current election, we have 12 candidates for six Council positions. Cast your vote at alumni.hms.harvard.edu/election or by using the ballot mailed to your home. Candidate bios and personal statements are available online; winners will be announced May 31 during the HMAA's annual meeting.

Join us and make your voice heard.

Nancy Rigotti '78 is an HMS professor of medicine at Massachusetts General Hospital.

DR. RUIZ GOES TO WASHINGTON

California lawmaker credits mentors at HMS

RAUL RUIZ '01, a California emergency physician, grew up in an immigrant community in that state's rural Coachella Valley. As a high-school senior, he visited local businesses, raising money for college tuition with a pledge to use his education to serve his community.

In November 2012, Ruiz was elected to represent California's Thirty-sixth Congressional District and is now bringing a physician's viewpoint to Congress. "I will always be a physician, and my approach to problem solving will be based on the skills and approaches we learned at HMS and in training," says Ruiz. "I will bring that perspective to Congress in order to be part of a larger team that will look out for the common good."

The son of farmworkers, Ruiz "from the very start made it clear that he was committed to returning to work with the indigenous community in which he grew up," says Alvin Poussaint, HMS faculty associate dean for student affairs, who remembers Ruiz as a passionate student with a gift for inspiring others.

Poussaint is one of the people Ruiz credits with shaping his path. "I was fortunate to have wonderful mentors at Harvard Medical School who inspired me to think locally and globally and who re-instilled a dedication and determination to improve people's lives through health," Ruiz says. "One of the things that I appreciated from my mentors was to have the lens of a physician."

Ruiz entered HMS from the University of California at Los Angeles, planning to train in surgery, Poussaint recalls, but changed his specialty to emergency medicine because he saw a greater need.

Conversations with Dean of Students Nancy Oriol '79 led Ruiz to pursue a master in public policy from the Harvard Kennedy School; he completed his MD and his MPP in 2001; in 2007 he added a master of public health from the Harvard School of Public Health.

After his training, Ruiz made good on his pledge and returned to California. There, he founded the Coachella Valley Healthcare Initiative with a mission to improve public health and health care access in the region.

A Mexican-American of Indian heritage, Ruiz was active in American Indian and Latino student groups at HMS. During the last weeks of his congressional campaign, Ruiz's opponent criticized his activism as an HMS student, citing his 1997 arrest at a demonstration in Plymouth, Massachusetts, protesting the treatment of American Indians.

Ruiz's HMS mentors, however, cite the incident as early evidence of Ruiz's leadership and commitment to work for change. In addition, Poussaint and others laud Ruiz's ability to listen and build consensus, valuable in a physician and in a legislator.

—R. Alan Leo

STANLEY ROWIN (LEFT); JAY CALDERON/THE DESERT SUN

SPACE LIFT

HARVARD MEDICAL SCHOOL was lauded for its innovative curriculum and medical education facilities when it launched the New Pathway in the mid-1980s. The curriculum and its supporting facility, the Tosteson Medical Education Center (TMEC), were designed to encourage small-group learning and problem solving. The effects of this bold reform were not limited to medical education at HMS: They influenced the design of medical education worldwide.

But much can change in a quarter century. And although HMS continues to earn accolades for its curriculum developments and maintains its position as a global leader in medical education, the School's efforts to upgrade its medical education facilities have lagged.

"TMEC was designed for the New Pathway, namely, small groups, societies, and lab facilities," says Jane Neill, HMS associate dean for medical education planning and administration. "It can't accommodate tutorial groups of more than 10 people. We need space that's more flexible."

In fact, the Liaison Committee on Medical Education, which reaccredited the School in 2011, recommended the medical education facilities be updated, citing the need for a new clinical skills area within the next two years. Work to meet that recommendation is under way.

Situated on the first floor of TMEC, the 5,500-square-foot Clinical Skills Center will include 18 exam rooms that will be used for objective structured clinical exams for second- and third-year students and for teaching clinical skills. Ten of the exam rooms will have movable walls, allowing them to be converted into five rooms complete with wireless simulation mannequins.

Demolition for this $5 million project has begun, and construction will be completed in time for the 2013–14 academic year. According to Rick Shea, HMS associate dean for campus planning and facilities, a more comprehensive project is happening simultaneously.

An architectural firm is taking inventory of TMEC's 113,000 square feet of space and its use, and asking faculty, staff, and students what types of facilities are needed for both medical and graduate education. The firm will compile the data and make recommendations on design and programming alternatives.

Citing the need for more study space, better lighting, comfortable seating, and a café, Shea says, "We have the opportunity to reimagine this space, align it with the new curriculum and smart technology, and improve the students' on-campus experience."

With an estimated price tag of around $50 million for the building's renovation, the School will seek philanthropic support for this much-needed modernization.

Neill is excited about how changes being worked on by the task force that is comprehensively reassessing the preclerkship curriculum will dovetail with the TMEC renovation plans.

"This is Harvard. Our students and our faculty are superb," says Neill. "We need a curriculum and education facilities that match the needs and expectations of twenty-first century learners and teachers."

—Laura DeCoste

JOHN SOARES

1945

Giulio D'Angio
I fully retired in September. I attended the meeting of pediatric oncologists in London in October, probably for the last time. My son was promoted to full professor of pediatrics at the University of Rochester. Granddaughter Sara was ordained an Episcopal deacon in October. Another son began serving at Trinity Church in Covington, Kentucky, as the rector. My wife has matriculated the second class of St. James School in Philadelphia, which serves a traditionally underresourced student population.

1946

Theodore H. Wilson, Jr.
My four children, five grandchildren, and two great-grandchildren, with assorted spouses and friends, hosted a 90th birthday party for me at the retirement community where I have been living happily for a dozen years.

1952

Armand Lefemine
My book, *US and World Medical Care*, was published electronically in August.

1953 60th REUNION

Charles Barnett
Now retired in every aspect. Patsy and I are healthy and content in Sonoma Valley, California.

P. Herbert Leiderman
I am currently caring for my wife of 65 years who is in long-term care, writing a memoir of my service during World War II, and reading history. Harvard connects several members of my family: my wife (PhD), daughter (BA), and son (MA).

1955

David Fischer
I have been honored with the Richard Blumenthal Patient Advocate for Life Award by the Connecticut Hospice, the first hospice in the U.S., which I cofounded. My book, *The Clinical Cancer Program at Yale*, was published in 2012. I continue to work three days a week at Yale Medical School where I am cochair of the cancer committee and chair of the transfusion and tissue committee.

1958 55th REUNION

George Spaeth
I have published *Family Voices*, a collection of writings from 20 members of four generations of my family. My recent surgical text, *Ophthalmic Surgery: Principles and Practice*, is being translated into Chinese and Spanish. I was excited to receive the research award of the European Vision and Eye Research Association in August.

1960

William T. Green, Jr.
I worked in Harold Amos's lab at HMS when he was an instructor and I was a student. He taught me techniques that I later used in cell culture. He was a true mentor.

1961

Robert Flescher
Still chugging along in semiretirement, working in the gastrointestinal clinics of two local hospitals; practicing medicine, largely in Spanish; and working one and a half days a week and feeling virtuous. Otherwise, I'm gardening and playing tennis doubles. I've recovered from one knee replacement last year but will need the other done next year.

1963 50th REUNION

James Cassady
Since my retirement as chair of radiation oncology at Lahey Clinic in Burlington, Massachusetts, in 2011, life has been eventful. Deborah and I celebrated our 50th anniversary; Rob, our son, climbed Mt.

LIZA GREEN

CLASS NOTES

NEWS FROM ALUMNI

Everest in May; and I was awarded the Gold Medal for 2012 by the American Society of Therapeutic Radiation Oncology.

Donald Klein

After 42 years, I retired from my allergy practice in December. I am basking in the sun in Naples, Florida, for the winter.

1964

Robert Northrup

We came to Ann Arbor two years ago from West Virginia to live between our Cleveland and Chicago children and grandchildren. What a fabulous place! I attend and give global health lectures. I am doing lots of singing and staying fit. The symptoms of aging are evident, but life is still full of delight. When you come to Ann Arbor, get in touch.

George Sarosi

I've officially retired, and have returned to Minnesota. I'm working eight months a year full-time as an attending at the Minneapolis VA.

1965

Leonard Kapelovitz

I retired last May. I very much enjoyed the practice of psychiatry and psychoanalysis, but retirement is terrific. I swim every day, read a great deal, and spend lots of time with Abbey, our children, and grandchildren.

James Nelson

I was coauthor, with Russell Brown, on two papers on the development of CT guided stereotaxis, both published in *Neurosurgery*.

1966

Joel Friedman

I retired from the practice of medicine in cardiology on July 3. I have now started volunteer teaching second- and third-year students at Stanford Medical School. I've started working out at our local YMCA three days a week, continue to play golf two or three times a week, do some gardening and reading, and take piano lessons. And best of all, Carol and I are still on good terms!

Jay Kaufman

I retired in February 2012, and have a busy schedule of golf, writing, and taking courses to fill in the large gaps in my knowledge. In August, I sustained a bump in the road in the form of bilateral pulmonary emboli without apparent cause. Soul searching ensued, but my recovery seems complete, and I have resumed thinking that I am (kind of) immortal.

1967

Oluwatope Mabogunje

In 2012 we welcomed our grandson, Orejimi. We are grateful for good health.

1968 45th REUNION

Arthur W. Boylston, II

My book, *Defying Providence: The Forgotten 18th Century Medical Revolution*, was published in November. It is a history of variolation—how and why people gave themselves and their children virulent smallpox. A few medical myths, such as Jenner's milkmaids, are overturned, and the contribution of variolation to the eradication of smallpox is recovered. Comments and queries welcome.

LIZA GREEN

J. Calvin Nafziger

Just retired, after open-heart surgery. Now doing locum tenens work.

H. Thomas Robertson, II

Slowly easing into retirement, with only one day a week of clinical work, all outpatient.

Robert Rutherford

Living well in Healdsburg, California. Working part-time as a general practitioner in a community clinic. I have a lovely wife, K.T., an organic garden, good friends, and wine. My daughter, Maya; her husband, Peter Baran; and grandsons, Sam and Will, have rekindled my life.

1970

Michael Millis

Still working on hip preservation surgery in the adolescent and young adult hip program at Boston Children's Hospital. Clinical and academic work remain enjoyable, but the hassles are increasing!

David Wyler

I recently moved to Rhode Island to enjoy "retirement" sailing. A forthcoming National Institutes of Health grant will have me back doing research on schistosomiasis at Brown University. I'm teaching pre-health career students at the University of Rhode Island. Fun!

1973 40th REUNION

Jesse E. Thompson, Jr.
This past year, shortly after I turned 65, I retired from my full-time job as chief of surgery at the Olive View-UCLA Medical Center. My wife, Alice, and I are considering moving to Santa Barbara, California, and are looking forward to a lot of travel.

1975

Patricia Gerbarg
With my husband, Richard Brown, I published two books in 2012: *The Healing Power of the Breath: Techniques to Reduce Stress and Anxiety, Enhance Concentration, and Balance Your Emotions* and *Non-Drug Treatment for ADHD: New Options for Kids, Adults, and Clinicians.*

Steven Varady
I'm working at urology almost full time, and my wife is teaching half time. We're in good health. One of our two sons is engaged, the other has chosen a health care MBA program—go figure. The transition to electronic medical records has been an intellectual challenge, as most of the information ultimately must be entered in as "structured data." Once I understood this concept, and the mandates on it, the transition became less personally upsetting.

1976

Marvin Bittner
I'm just about halfway through my two-year term as president of the Omaha Medical Society.

Douglas Johnson
After more than 30 years in Boston, I moved to Springfield, Massachusetts, to join the Pulmonary Medicine Department at Baystate Medical Center.

1978 35th REUNION

Kenneth Franklin
Still living in New York City and Connecticut and working as a clinical associate professor of medicine within the Division of Cardiology at New York-Presbyterian Hospital/Weill Cornell Medical Center. Enjoying what I do and planning on continuing for quite some time.

1979

Elizabeth Ruth Woods
I was honored in August as a Champion in Health Care in the category of community outreach by the *Boston Business Journal.*

1984

Richard Mitchell
I became a full professor of pathology and health sciences and technology at HMS, and was recently appointed vice-chair for education in the Department of Pathology at Brigham and Women's Hospital. My children, Matt and Becky, are enjoying post-college life, and Diane and I are enjoying remodeling our empty nest.

1986

John Puskas
Dan Carey, Frank Voss, and I completed the Olympic-distance Kiawah Island triathlon intact, without permanent injury to either our bodies or our longstanding friendship! Dan leads a large group in the private practice of interventional cardiology in Lynchburg, Virginia; Frank is the longest-serving member in the Department of Orthopedics at the University of South Carolina in Columbia; and I am chief of cardiothoracic surgery at Emory University Hospital Midtown in Atlanta.

1987

Raymond Price
The American College of Surgeons awarded me the American College of Surgeons Pfizer International Humanitarian Award in October. Earlier in 2012, I was honored with a visiting professorship from the Health Sciences University of Mongolia and received an honorary membership in the Mongolian Surgical Society for improving access to modern surgical care throughout Mongolia. While continuing private surgical practice at Intermountain Healthcare, I also serve as associate director of the Center for Global Surgery at the University of Utah.

1990

Douglas Bell
I'm still loving life in Los Angeles, doing informatics research at UCLA and the RAND Corporation, and practicing general internal medicine. I recently assumed leadership of the biomedical informatics program at UCLA's Clinical and Translational Science Institute.

1993 20th REUNION

Jessica Wu
I was thrilled to see my book, *Feed Your Face*, reach Amazon's Top 100. It will be coming out in the United Kingdom, China, and Russia next. I was certified as a ski instructor at Whistler, British Columbia; Florin and I will spend much of the winter there. Looking forward to our 20th reunion!

1998 15th REUNION

Samantha Butts
I have been recognized by *The Network Journal* as one of its annual "40 under Forty" honorees in 2012. Winners are selected from a pool of top-level business executives nationwide. *TNJ* is a New York–based magazine publisher that provides news and advice to African American businesses and professionals.

2006

Nirav Nikhil Vakharia
After spending two years living in Doha, Qatar, and working on a project with Partners HealthCare, my wife, two daughters, and I moved to Ohio, where I am working for the Cleveland Clinic.

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If you have updates you'd like to share in Class Notes, you can now submit them easily and securely to classnotes@hms.harvard.edu. Be sure to include your full name and class year.

OBITUARIES

REMEMBERING DISTINGUISHED LIVES

1930s

1937

Robert Goldstein
April 27, 2012

Orvar Swenson
April 13, 2012

1938

Dauchy Migel
December 11, 2012

1939

Robert M. Johnson
October 20, 2012

1940s

1940

Lewis H. Bosher, Jr.
August 21, 2012

Alfred Kahn, Jr.
February 17, 2013

1941

Joseph M. Foley
July 13, 2012

Thomas H. Sappington
February 1, 2013

John E. Stewart
April 17, 2012

This listing of deceased alumni and their dates of death include those alumni who died between April 1, 2012, and March 3, 2013. Links to full obituaries of these alumni can be found at **alumni.hms.harvard.edu/community/in-memoriam.html**.

If you know of an HMS alumna/us who has died recently, please send an email with the link to the obituary to **hmsalum@hms.harvard.edu**.

1943

Richard C. Bagnall
October 7, 2012

William D. Blake
February 3, 2013

Ben Eiseman
November 19, 2012

Robert J. Glaser
June 7, 2012

Rudolf A. Jaworski
April 18, 2012

Joseph E. Murray
November 26, 2012

Benson B. Roe
August 6, 2012

1944

Sheridan S. Evans
January 21, 2013

Felix Heimberg
January 4, 2013

Peter J. Koeniger
June 20, 2012

Robert E. Scully
October 30, 2012

1945

John P. Bunker
May 4, 2012

Edward W. Friedman
January 5, 2013

Edward A. Gaensler
November 19, 2012

Edmund J. Harris
September 20, 2012

Norman P. Hill
December 1, 2012

Donald L. Somerville
July 12, 2012

1946

Frederick C. Goetz
August 28, 2012

Edwin O. Hirsch
October 3, 2012

E. Donnall Thomas
October 20, 2012

1949

Sam L. Clark, Jr.
November 9, 2012

Erle E. Peacock, Jr.
October 25, 2012

Robert H. Puite
April 3, 2012

Leonard J. Robinson
March 30, 2012

1950s

1951

William S. Karlen
June 6, 2012

Jesse B. Kellum
January 10, 2013

Willard E. Lohnes
October 21, 2012

Arthur C. Quackenbush
April 2, 2012

1952

Lawrence S. Carlton, Jr.
October 10, 2012

Warren G. Guntheroth
September 17, 2012

Gerald D. Klee
March 3, 2013

Henry D. Webster
November 16, 2012

1953

Edwin L. Carter
November 15, 2012

Arthur Scott Earle
November 27, 2012

Virgil F. Ficarra
April 16, 2012

Richard B. Gibson
February 6, 2013

Fritz Loewenstein
October 18, 2012

Warren C. Nagle
January 20, 2013

1954

William R. Byrne
February 11, 2013

Franklin T. Evans
August 28, 2012

Robert H. Jones
August 14, 2012

J. Donald Ostrow
January 9, 2013

John A. Peters
June 22, 2012

James C. Tucker
August 31, 2012

1955

John D. Allen
December 7, 2012

Robert P. Hardman
April 21, 2012

Peter B. H'Doubler, Sr.
December 7, 2012

Harold C. Urschel, Jr.
November 12, 2012

1956

John J. Ross
July 17, 2012

Marianne F. Schwob-Ferrara
April 20, 2012

1957

John L. Lewis, Jr.
September 18, 2012

Robert G. Mossman
October 10, 2012

1958

Jeannette H. Corwin
April 27, 2012

George H. Gifford
December 20, 2012

Lewis P. James, Jr.
December 25, 2012

Jordan Joseph
December 4, 2012

Norman E. Matthews
May 9, 2012

Philip W. Shambaugh
October 7, 2012

1959

Evangelos T. Angelakos
January 2, 2013

Costan W. Berard
January 6, 2013

John D. Poutasse
October 22, 2012

1960s

1960

Marshall M. Kaplan
September 1, 2012

1961

Walter R. Anyan, Jr.
February 16, 2013

James H. Stephans
September 18, 2012

Robert C. Wheeler, II
October 22, 2012

1962

Robert P. Beasley
August 25, 2012

Eugene Dicero
January 5, 2013

Dexter W. Lawson
January 22, 2013

1965

Kenneth H. Mueller
August 14, 2012

1966

John M. Ludden
August 5, 2012

1967

Ione A. Kourides
October 4, 2012

1968

William A. Grana
February 1, 2013

1969

David L. Freeman
July 8, 2012

1970s

1970

Jonathan D. Ain
November 28, 2012

1972

Edmund B. Cabot
September 1, 2012

1978

Damian H. Augustyn
October 3, 2012

1979

S. W. Casscells, III
October 14, 2012

Eric S. Swann
December 7, 2012

1980s

1985

Kenneth A. Dressler
July 28, 2012

2000s

2003

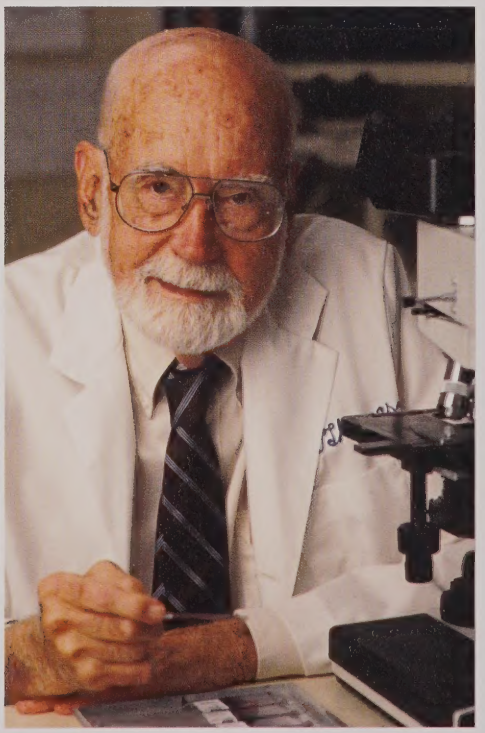
Christine M. Weeks
June 20, 2012

IN MEMORIAM

Joseph E. Murray '43 died on November 26, 2012, at the age of 93. A reconstructive plastic surgeon, Murray was perhaps best known for being part of the first surgical team to successfully transplant a human organ, the kidney.

E. Donnall Thomas '46 died on October 20, 2012, at the age of 92. After years of research, Thomas successfully transplanted bone marrow from unrelated donors into patients with blood cancers or other blood disorders.

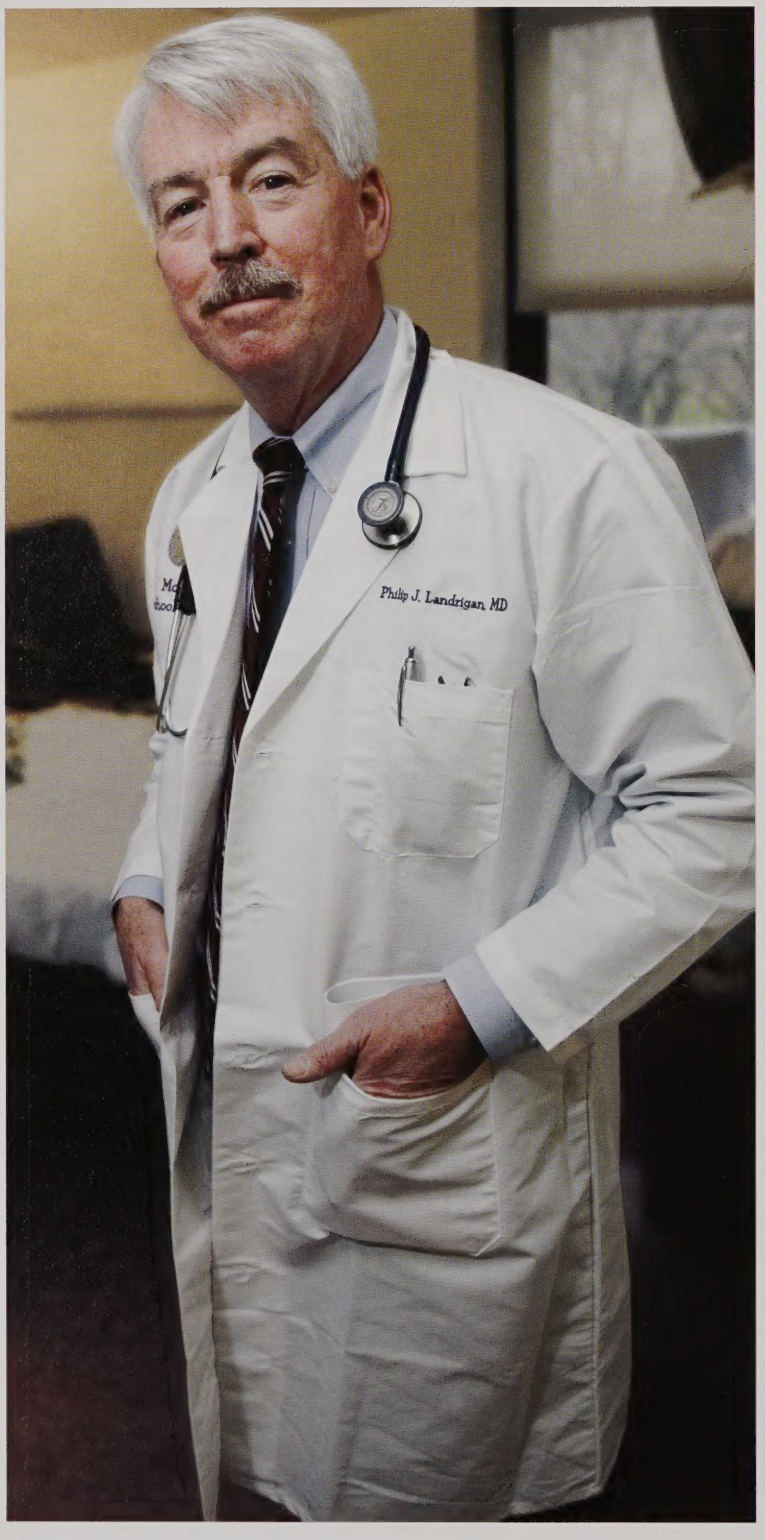
Murray (left) and Thomas shared the 1990 Nobel Prize in Physiology or Medicine for their contributions to the field of transplantation medicine.



ERIC MILLER/ASSOCIATED PRESS (LEFT); SUZIE FITZHUGH/FRED HUTCHINSON CANCER RESEARCH CENTER

TAKING A HISTORY

PROFILE OF PHILIP LANDRIGAN



GARY WAYNE GILBERT

CLAIMS TO FAME: Ethel H. Wise Professor of Pediatrics and Chair, Department of Preventive Medicine; Director, Children's Environmental Health Center; Dean for Global Health, Icahn School of Medicine at Mount Sinai; former lead investigator, New York Vanguard Center, National Children's Study.

REFRESHER COURSE: When Philip Landrigan '67 arrived in Atlanta in 1970, he was a newly minted pediatrician with Boston roots who knew nothing about epidemiology. Landrigan had been chosen by the CDC, then the Communicable Disease Center, to serve the two years of national service required during the Vietnam conflict, and was assigned to the Epidemic Intelligence Service, a program that trains young doctors to become public health epidemiologists. "I figured I'd go to Atlanta for two years, fulfill this obligation, and return to academic pediatrics in New England," he says. That's not what happened.

GETTING THE LEAD OUT: Landrigan's work in Boston with children who had paint-related lead poisoning led to an assignment to investigate reports of pediatric lead exposure in El Paso, Texas. The lead source, he found, was not paint; it was dust and soil contaminated by discharges from a smelting plant's smokestack. Landrigan showed that this lead had eroded IQs and slowed reflexes even in children without symptoms of exposure. With this and other research confirming the toxic effects of low-level lead exposure in the environment, in 1975 Landrigan and colleagues persuaded the U.S. Environmental Protection Agency to remove lead from gasoline.

GEN NEXT: The El Paso findings spurred Landrigan to propose forming what is now the CDC's National Center for Environmental Health. He later headed the National Academy of Sciences' Committee on Pesticides in the Diets of Infants and Children, which laid the groundwork for the Food Quality Protection Act of 1996—the only federal pesticide law and the only federal environmental law with explicit standards to protect the health of children. That work fueled his organizing what would become the EPA's Office of Children's Health Protection, and to his tenure as chief investigator for the New York Vanguard Center of the National Children's Study, launched in 2009. This longitudinal study will track environmental exposures and their influences on the health of 100,000 U.S. children in order to identify preventable risk factors.

SMALL VOICES, GREAT JOY: "I think there's something very joyous about working with children," says Landrigan. His work, he says, has heightened his awareness of the links between social justice issues and environmental threats to health. "It bothers me greatly that within America environmental hazards fall most heavily on those who have the smallest voice." Landrigan has successfully navigated the political system to make a real impact on children's health, and he plans to continue to do so. "Just as they say, the price of freedom is unceasing vigilance; it's no different in keeping the world healthy. It requires constant work." —*Angela Alberti*

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"Naming HMS as a beneficiary of my IRA was a philanthropic priority because I owe my career to the School and its affiliates. It's an amazing place to learn."

– David Nathan, MD '55

Recipient of an honorary Doctor of Science degree from Harvard University in 2010

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Harvard Medical School alumnus and faculty member David Nathan, MD '55, is a pioneer in the field of pediatric hematology and oncology. As president of Dana-Farber Cancer Institute from 1995–2000, the National Medal of Science winner is credited with transforming the HMS affiliate into a world-class cancer facility.

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